ELECTRICAL REVIEW
AND
WESTERN ELECTRICIAN

VOL. LV, NO. 15. CHICAGO, SATURDAY, OCTOBER 9, 1909. ISSUED WEEKLY

BY THE
ELECTRICAL REVIEW PUBLISHING COMPANY.
CHARLES W. PRICE, President and Treasurer.
A. A. GRAY, General Manager. H. S. TUTHILL, Secretary.
C. W. FORBRICH, Assistant Treasurer.

PUBLICATION OFFICE: MARQUETTE BUILDING, CHICAGO.

EASTERN DEPARTMENT . . . . . 13 Park Row, New York.
E. E. Wood.
EUROPEAN OFFICE . . . . . 42 Old Broad Street, London, E. C.
Henry W. Hall.

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SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back numbers, beyond one month, each . .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

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CONVENTION OF THE ILLUMINATING ENGINEERING SOCIETY.

The Illuminating Engineering Society has passed a crucial point in its development in a most successful manner. The third annual convention, a full report of which is given on other pages of this issue, will be remembered for both the number and the quality of its papers and the high standing of the members who not only attended but also discussed the papers. A registration of only 244 members, less than one-quarter of the total membership, was partly due to the fact that many of the New York members were busily engaged in perfecting the lighting arrangements in connection with the Hudson-Fulton Celebration.

The convention lasted three days, and during that time there were eighteen papers and one lecture, three reports and three addresses delivered. The subjects covered work in both America and Europe and at least two of them will undoubtedly find their way to the technical press of the entire world.

Among the papers presented was an admirable one by Mr. E. L. Elliott on "The Ethics of Illuminating Engineering," which may well form the basis of the professional practice of this young branch of the engineering profession. The two papers describing the laboratories of the United Gas Improvement Company and the National Electric Lamp Association show in the former case the high standard of scientific refinement that the gas interests now recognize as being necessary in the conduct of all laboratory tests of lighting devices, and in the latter the laudable determination of a commercial body to institute researches into the exact determination of the physical, physiological and even psychological principles underlying the art of illumination; the results of these researches will doubtless prove of the utmost value to the illuminating engineer.

The paper on "The Light of the Fire-fly" that was presented by Drs. Ives and Coblentz brings out forcibly the extraordinarily high efficiency of this little creature as a light producer. Its luminous efficiency was ascertained to be 96.5 per cent, as compared with 1.3 per cent for what we are accustomed to regard as the high-efficiency tungsten lamp. This is a striking presentation of the great strides that we must make in order to achieve anywhere near the efficiency of natural light. It must be said, however, that the light of the fire-fly is of too restricted an order of radiation, being strongly green. The authors of the paper in question have estimated that a luminous efficiency

of forty-five per cent may be regarded as the maximum theoretically attainable for pure white light. Even at this estimate there is room for increasing the efficiency of illuminants nearly thirty-five times over that of the tungsten lamp.

Dr. Louis Bell presented a simple and yet classical outline of the principles of shades and reflectors in his paper of that title, in which he also cautioned against very heavy etching of prismatic glassware. The problems involved in heterochromatic photometry were portrayed by Mr. Preston S. Millar and will doubtless stimulate further investigation of methods for reducing the errors of light comparisons with sources of different colors. The paper by Mr. L. B. Marks on "Factory Lighting" showed forcibly the wasteful and thoroughly unsatisfactory lighting conditions that are sadly too prevalent in even large shops. Messrs. Macbeth and Eustice submitted papers that draw attention to the great discrepancies found in actual commercial practice from the results theoretically estimated.

The papers referred to above are but a few of the more striking ones that were presented before the convention and show conclusively the important work that the society is carrying on and the intrinsic value of its proceedings to the betterment of the art of illumination.

INCOME FROM TUNGSTEN STREET LAMPS.

When tungsten lamps were first introduced some persons feared that they would reduce the income of central stations, but this does not appear to be the result as far as street lighting is concerned.

During the past year tungsten street lamps have been installed in large numbers, replacing the carbon incandescent, and even arcs to some extent, and yet the general result appears to have been to maintain the previous income from street lighting, and even to increase it in some cases.

This result has been attained by a division of the benefits from the higher efficiency of tungsten lamps, so that while the public has obtained more light, the rate per lamp or per substituted group of lamps has been little, if at all, decreased.

On going over a list of more than two score stations that have adopted the tungsten lamps for street lighting to the substantial exclusion of the incandescent carbon filament, and in some instances for a part or even all of the arcs, numerous examples are noted that support the above conclusions.

Thus, a small town that formerly had seventy-two incandescent street lamps of thirty-two candlepower for which it paid the electric company $25 each per year has exchanged these for seventy-four tungsten lamps of forty candles each, and pays the same rate per lamp. Another town formerly had 180 street incandescent lamps rated at twenty-five candlepower, for which $18.75 per lamp-year was paid, and now there are 190 tungsten lamps of forty candlepower in their place at the same rate per lamp. Where there were thirty-eight incandescent lamps of twenty candlepower and twenty-one arcs of 2,000 nominal candlepower in a certain town last year, which gave the central station an income of $2,154, there are now 245 tungsten lamps of forty candlepower on the streets that yield an income of $4,165 per year to the electrical supply company.

Among the larger places is a city that a little more than a year ago was paying $15 annually for each of 630 street lamps of twenty-five candlepower each, and now the equipment is 637 of forty candlepower and the rate is still $15 each. In another city 1,153 street lamps of twenty-five candlepower have given way to 1,157 tungsten lamps of forty candlepower, with no reduction of rates. Arc lamps that were lighting the streets of another city have been replaced in part by 1,500 tungsten lamps of 100 candlepower each, at a more than equivalent rate.

Besides the substitution of tungsten lamps for the carbon incandescent and the arc, there has been an important gain to the income of central stations by the selection of the tungsten lamps for streets where mantle gas burners would have been used rather than the carbon incandescent. In one instance of this sort 572 of the sixty-candlepower tungsten lamps were installed, at the rate of $23.48 each per year.

Tungsten lamps have had much to do with the extension of what may be termed display street lighting in business centers, which aims to attract people and patronage by artistic and intense lighting effects. An example of this sort is at hand where about fifty tungsten clusters of five sixty-candlepower lamps each have been located fifty feet apart in a business district, as an addition to the regular street lamps. The yearly rate for each of these clusters is $109.20, so that fifty increase the central-station income by $5,460 per year.

In another instance seventy-six arches of tungsten lamps have been erected across streets in the business center of a city, at an annual rate of $126 per arch, thus giving an income of $9,576 per year. In each of these arches there are eighteen tungsten lamps of sixty candlepower, ranged five feet apart, and the distance is 100 feet from arch to arch.

Sign lighting has been much increased by the low rates made possible with tungsten lamps, and this may be considered a special form of street illumination in many cases.

CENTRAL-STATION DEVELOPMENTS IN MASSACHUSETTS.

Centralizing tendencies are making themselves felt very strongly in Massachusetts electric light and power circles at the present time. The Edison Electric Illuminating Company of Boston is expanding along highly economic lines, taking into its efficient organization various suburban lighting properties which have previously been independently operated, and supplying its notably reliable power to several electric railways at a considerable distance from the city. These roads have for years past depended upon a none too efficient and steady self-generated service. Reductions in rates amounting to at last twenty per cent accompany the absorption of these properties in several instances, thus effectively disposing of the charge so often made that consolidation offers an excuse for an increase in prices. Waltham, Newton, Brookline, Brighton, Watertown and Chelsea are the latest Boston suburbs to benefit from the establishment of full Edison service

at downtown rates. It is an undisputed fact that in many of these suburbs gas has held sway for so long that electric lighting has been used less extensively than in many of the towns of equal size in the West, so that the separation of the gas from the electrical business in the latest Massachusetts consolidation opens the way toward a much larger application of electricity for both lighting and power service than has before appeared feasible.

At a meeting of Massachusetts electrical men in Swampscott a few weeks ago, Mr. Everett W. Burdett predicted that the trend of development in the Bay State is to be along the lines of centralization in power supply, with the gradual elimination of small and relatively wasteful stations, the assumption of executive responsibilities by a few well-trained managements, and in general the expansion of electrical service in fields as yet little utilized. Already this movement toward larger savings and broader revenues is well under way, and under the progressive supervision of the Massachusetts Gas and Electric Light Commission there is likely to be little opportunity for even the most cordial enemies of centralization in public utilities to fear the expansion of the Boston system into the larger field of power and lighting supply westward from the New England capital.

Another important movement is the advance of the service of the Connecticut River Transmission Company into Worcester County, entrance into the city of Fitchburg now having been granted under restrictions previously reviewed in these columns. Franchises have been granted to the company for the supply of energy in the city of Worcester and the town of Clinton, and in each case the local companies have appealed to the Commission against the action of the municipal authorities. The Worcester case has been heard, and the Clinton appeal has yet to be argued. In each of these cases the same general principles of action on the part of the local companies appear, the fundamental cause of dispute being over the small power business.

As the transmission company has publicly announced its desire to be a wholesaler rather than a retailer of electrical energy, and as the Commission laid down with extreme care in the Fitchburg case the sphere of each power-producing organization's acceptable activities, it is singular that the municipal authorities continue to impose in franchise grants terms requiring the sale of hydroelectric power to consumers whose installations are of very small capacity. There is no longer any doubt that the entrance of Connecticut River power into central Massachusetts can be made a permanent benefit to the communities supplied, and without interfering with the legitimate prosperity of the older central-station organizations. While the small consumer may not at once profit in direct measurable rate reductions from the entrance of the Transmission Company's power, he cannot fail to benefit indirectly from the introduction of this service, which will probably tend to reduce the cost of operation somewhat in the local stations handling it.

METER EXPENSES.

Meter expenses make up a rather large item in the annual cost of operating an electrical supply system.

In connection with a large plant that has about 25,000 meters in use, the cost of meters that were discarded in a recent year, and the cost of rebuilding meters, and the cost of erection and removal of meters on the premises of consumers was $19,874. The number of discarded meters that went to make up this item was 509 for the year.

An additional item of expense in this same year was $21,534 for the wages of meter-repair men, and $6,830 for the material, teaming and other expense connected with this work. The wages of meter readers for the year amounted to $8,860, and incidental expenses connected with reading raised the total under this heading to $10,511.

In a hearing that involved the above matters, the following estimate was offered of the necessary annual expense per small meter of not over twenty lamps capacity.

The average first cost of these small meters was said to be about $12 each, and to this sum was added $1.50 per meter for the cost of installation. For interest and depreciation on each of these meters the annual expense was put at $2.79, on the basis of a life of seven years and interest at six per cent.

Testing and repairs on each meter were put at the average figure of seventy-seven cents per year, and for the reading of the meter the estimate was forty-two cents. Each small consumer was said to have ten lamps on an average, valued at $1.60, and twenty per cent of this sum, or thirty-two cents per meter, was taken to cover interest and depreciation.

As each meter constantly consumes a small amount of energy when connected to the circuit, whether any current is supplied through it or not, the cost of this lost energy was estimated at $4.80 per meter per year.

The above-mentioned cost to the company per meter was intended to cover interest and depreciation on its cost, and also billing, testing, postage, reading and the energy consumed.

For all meters on the system, large and small, the average cost of testing and repairs was $1.10 per meter per year, and this was based on the practice of testing meters once a year. As to the estimate of $4.80 per year for energy wasted in the meter, this figure was based on the rate of twelve cents per kilowatt-hour for this energy. The cost of reading and billing was estimated to be the same for large and small meters.

THE HUDSON-FULTON CELEBRATION.

After all the proof of the pudding is in the eating and what you see you know and realize. Most people could not see the great and glorious carnival held in New York the past two weeks. But we are now able to reproduce photographs of what is now acknowledged to be the greatest illumination in the history of the world. Particular attention is drawn to the wonders of the scintillator—every color of the rainbow directed on steam and the effect lovely beyond conception.

American Street and Interurban Railway Association.

(*By telegraph to the* ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.)

Denver, Colo., October 5.—The 1909 convention of the American Street and Interurban Railway Association and its affiliated associations was opened auspiciously Monday morning, October 4. Before noon upward of 3,000 delegates, manufacturers' representatives and guests had been registered. The special train service that had brought this large gathering to Denver was excellent. On arrival the delegates found the hotel accommodations to be very good and the weather perfect.

The first session of the American Street and Interurban Railway Transportation and Traffic Association was called to order at the Auditorium yesterday at 2:30 p. m. An address of welcome was delivered by John A. Beeler, vice-president and general manager of the Denver City Tramway Company and vice-chairman of the local entertainment committee. Following this came the presidential address of C. Loomis Allen. In this President Allen called attention to the fact that, although the association had been organized only in January, 1908, it had held a very successful meeting at the October convention last year. This year the executive committee had determined that the programme would be devoted to the reading and discussion of the reports of standing committees and of papers forming parts thereof. The adoption of these reports will give to the transportation world the results of the best practice up to date. Future changes in operation will be made amendments, and modifications of the reports will be necessary from time to time. Therefore, the committee work must be continued.

The report of the executive committee covering the action taken at the meetings held January 28 and July 19, 1909, was read. The report of Secretary and Treasurer Bernard V. Swenson was read by him. The report of the committee on passenger traffic was read by its chairman, M. C. Brush, who took the chair during the discussion of this report. This committee made an elaborate exhibition of advertising literature in the form of timetables, illustrated and descriptive folders, posters and display advertising. The discussion was opened by E. F. Peck, who said that his own experience convinced him that high-class pictorial folders, timetables and newspaper advertising was extremely beneficial in creating passenger traffic. F. W. Coen said that he believed the liberal use of advertising devoted to some particular attraction was most beneficial. One of the best means of advertising, he had found, was the publication of a large pictorial map; a supply of 100,000 of these had been exhausted in ninety days. H. S. Page said the interest aroused by advertising, in the form of timetables, folders and posters, far surpassed his expectations. F. E. Hunt and P. P. Crafts also discussed the report, the latter describing some very effective circular-letter advertising in directing attention to pleasure parks. J. W. Brown, D. C. Cherry, J. H. Pardee, W. H. Collins, J. C. Calisch, Ernest Gonzenbach, C. L. Allen and R. P. Stevens contributed valuable features to this general discussion.

The Claim Agents' Association also held their first meeting Monday afternoon at the Hotel Metropole. Among the questions discussed were the best means of preventing collisions of cars and of cars with vehicles and pedestrians, and also how can the numerous accidents to passengers in boarding and alighting from cars be diminished or prevented?

On Monday evening there was a brilliant reception, given by the officers of the various associations to the degelates and guests. This took place at the Brown Palace Hotel. Before the reception the famous marching band, Cook's Drum Corps, of Denver, gave a very fine concert. The reception was attended by the very large number of visitors and all the social and business leaders of Denver. Vocal selections were rendered by Madam Sobrino, of London, and Clifford Wiley, of New York city. Informal dancing followed.

This morning (Tuesday) the entire session of the Transportation and Traffic Association was devoted to the discussion of the report of the committee on interurban rules. At the close of this discussion the report was adopted and the committee was instructed to confer with the rules committee of the American Railway Association, and to report back to the next annual convention.

The Claim Agents' Association during its meeting this morning discussed what is the best plan of having trainmen procure and report an increased number of witnesses to accidents. Another matter considered was whether it is good practice when a statement of the injured party is obtained to give that party a copy of the statement. The concluding topic considered was whether a school of instruction for trainmen is essential.

The first session of the parent organization, the American Street and Interurban Railway Association, was opened at 2:15 p. m. today at the Auditorium Hall, by the reading of the minutes of the previous meetings of the executive committee. The association was formally welcomed to Denver by William G. Evans, president of the Denver City Tramway Company.

The presidential address was delivered by James F. Shaw, who stated that the cities west of the Mississippi River represent twenty per cent of the association's membership and contribute twenty per cent of its resources. However, up to the present time they have been neglected as convention centers. Western companies are justly entitled to have the convention held in their territory occasionally. Everyone must concede that Denver has one of the finest street-railway systems of the country. The steady improvement of commercial conditions, making easy money possible, will permit of greater development in railway construction. The increased investment for modern systems justifies in many cases an increase in rates of fare, and a scientific charging for service tendered is an important step. The recently imposed corporation tax is unfair, as it penalizes the pioneer and imposes a burden upon the stockholder. A tax upon income in emergencies would be more equitable. Public-service commissions, to be effective, must protect the corporation and employe just as well as the traveling public. No new electrification plans of great magnitude have been announced recently, but those companies which have adopted electrification are well satisfied.

Reports were submitted from the committees on subjects, active membership, associate membership, suggestions of former President Goodrich, and education. A paper entitled "Organization, from the Standpoint of a Small Company" was then read by Ernest Gonzenbach, president and general manager of the Sheboygan (Wis.) Light, Power and Railway Company.

The Engineering Association opened its convention this afternoon in the Rose Parlor of the Auditorium by the presidential address from President Paul Winsor, the reports of the executive commit-

tee and of the secretary and treasurer. Most of the session was taken up by a discussion of the report of the committee on way matters.

The Claim Agents' Association at its session today discussed newspaper information, the relation of the medical and claim departments, and the relation of the claim and operating departments.

This evening a grand performance by the Railway Supply Men's Amateur Theatrical Association was given at the Tabor Grand Opera House. In this effort the supply men were assisted by the Denver City Tramway Minstrel Troop and Band.

There is a magnificent exhibit of electric-railway apparatus by the members of the Manufacturers' Association. The entire floor space and gallery of the great Auditorium is filled, and an immense tent has been built in the form of an "L" flanking the Auditorium on two sides. Probably the most conspicuous exhibits are made by the Allis-Chalmers Company, the General Electric Company and the Westinghouse Electric and Manufacturing Company, the latter's exhibit of the multiple electropneumatic brake system being the most unique and comprehensive ever assembled. The Buckeye Electric Company is making a fine exhibit of tantalum street-railway lamps and has also equipped 300 of the local cars of the Denver Tramway System with tantalum lamps. The Bryan-Marsh Company is also making an extensive exhibit of tantalum railway lamps in conjunction with the exhibit of the Allis-Chalmers Company. Other notable exhibits are those of the Western Electric Company, D. & W. Fuse Company, American Steel and Wire Company, Crouse-Hinds Company, Dearborn Drug and Chemical Works, G. M. Gest, H. W. Johns-Manville Company, Massachusetts Chemical Company, National Carbon Company, Ohio Brass Company, John A. Roebling's Sons Company, Rail Joint Company, Speer Carbon Company, Stromberg-Carlson Telephone Manufacturing Company, and Wagner Electric Manufacturing Company.

A full report of the entire Denver convention will be given in the next issue.

A. A. G.

Second Avenue Railroad.

The Second Avenue Railroad Company, New York city, has issued notice to the holders of general consolidated mortgage bonds of that company, requesting them to extend the life of the bonds to November 1, 1910.

Fight for Control of Worcester Electric Light.

Stone & Webster, of Boston, have sent out, through Kinsley & Adams, to stockholders of the Worcester Electric Light Company, an offer of $300 cash for each share of the electric-light stock.

Opposed to this, the largest stockholders of the company have sent out circulars to all the stockholders, announcing the formation of a holding company to secure control of the stock to prevent it from being bought up by outside operators, and to keep the Worcester Electric Light Company a Worcester concern. The trustees of the holding company offer $100 a share cash and two shares of the stock of the holding company, par value $100, for each share of the electric-light stock, the new stock to pay five per cent dividend. The capital of the holding company is to be $2,000,000.

It is the biggest struggle for control of a Worcester corporation that has taken place since the fight for the Worcester Consolidated Street Railway Company, which resulted in the New Haven interests buying control.

By the formation of the holding company, to be known as the Worcester Electric Securities Company, stockholders of the Electric Light Company, claiming to represent $350,000 of the capital stock, propose to overthrow the present management of the Electric Light Company and put in experts to develop the field in Worcester to the advantage of both the community and the company.

The present Worcester Electric Light Company is capitalized for $800,000, and the stock is quoted at $250 a share, on a par value of $100. The company has paid ten per cent and before that eight per cent dividends for two years. It is expected that the new stock company will pay an average dividend of five per cent a year.

Gigantic Consolidation of Public Utilities Rumored in Chicago.

During the past week the frequent rumors of consolidation of public-utility corporations in Chicago have been revived. This time, however, the scheme of consolidation is said to be on a much greater scale than ever attempted heretofore. In short, it includes all of the large public-utility corporations of the city with the exception of the gas company and the telephone company; in other words, it is said that steps are being taken to merge into one gigantic corporation all of the elevated and surface traction systems of the city, as well as the Commonwealth Edison Company. The combined capitalization of the projected consolidated corporation is said to be about $300,000,000.

In newspaper interviews with several heads of the various companies involved a general statement is made that such a large corporation would be feasible and advisable from the operating standpoint, but it would require the surmounting of very much greater difficulties than the hitherto attempted consolidations of the elevated systems only. The number of subsidiary interests is very large, and in any scheme of this kind each demands to be treated most liberally; therefore, if such a merger is to go through, it will require financing by men of practically unlimited resources. No definite statements as to whether any actual steps had been taken in carrying out this project could be obtained from anyone in authority.

Quarry Street Plant Enlargements.

The Commonwealth Edison Company, of Chicago, will spend $400,000 on the east section of its new Quarry Street plant. When completed, the east and west sections will represent an investment of $1,100,000 for buildings alone. The company is steadily enlarging its plants.

Receiver for Albany & Hudson Road.

On application of counsel for the Trust Company of America, Supreme Court Justice Betts appointed John W. Searing, of New York, receiver of the Albany & Hudson Railroad Company, which formerly operated an electric railway between Albany and Hudson, which was recently sold under a mortgage foreclosure. The property recently was taken over by a reorganization committee and is now owned by the Southern Railroad Company.

Third Avenue Railway Sale Put Off.

Judge Lacombe, in the United States Circuit Court, has again postponed the sale of the Third Avenue Railroad, New York city, under foreclosure. The sale is now set for November 30, the postponement being from October 27. The uncertainty created by the rejection of the reorganization plan by the New York Public Service Commission, and the fact that none of the creditors' suits which are before the Special Masters has reached a final determination, are given as reasons for the present decision.

ASSOCIATION OF CAR LIGHTING ENGINEERS.

SECOND ANNUAL CONVENTION AT THE HOTEL LA SALLE, CHICAGO, OCTOBER 4, 5, 6 AND 7.

The second annual convention of the Association of Car Lighting Engineers was held this week in the convention hall of the new Hotel La Salle, Chicago. In car-lighting circles this convention is the all-important event of the year, and a representative gathering of car-lighting engineers from all sections of the country was in attendance.

With this association is affiliated the Association of Car Lighting Supply Manufacturers, who contributed to the value of this meeting by their elaborate exhibits.

MONDAY MORNING SESSION.

The convention was formally opened at 10:30 a. m. Monday morning by President A. J. Farrelly. After the reading of the minutes of the previous meeting the president addressed the convention:

Mr. Farrelly said that on May 21, 1908, a little group of men met in the office of the signal engineer of the Oregon Short Line at Ogden, Utah, on the invitation of E. M. Cutting, and during the course of the meeting the formation of the association was proposed. There were only ten men present on that occasion, and the most optimistic predicted that, if nothing stood in the way, the membership of the association they were then forming would undoubtedly reach the hundred mark in a year, or in two years at the latest. The secretary's report showed the present membership to be 410, so that the prediction of the founders of this association was more than realized. Mr. Farrelly spoke of the increasing value of the association to its members and to the profession in general, showing how inquiries are being received from numerous car-lighting men in foreign countries, and stating that the association was receiving the recognition of railroad officials, which is evident by inquiries being made by officials as to what to recommend in the different problems to be decided. He spoke quite at length regarding the policy of the association, emphasizing conservatism in all matters relating to discussions, and also in the conduct of the members during the various conventions and meetings. On the subject of honorary membership Mr. Farrelly cited numerous instances where railroad officials had expressed their gratification at being elected members of the association. In conclusion the president stated the object of the association was for the betterment of the service of electrical practice on railroads, and the betterment of the individual members, and both of these objects are being realized, as is shown by the progress of the association.

Following the address of the president, C. R. Gilman, of the Chicago, Milwaukee & St. Paul Railway, proposed that the name of the association be changed from what it is at present to that of the Railroad Car Lighting and Electrical Association. Mr. Gilman stated that this change in name would broaden the sphere of work of the association and would include men who are dealing with the great variety of electrical problems to be met with at present. On account of the rapidly broadening scope of the activities of various members of the Association of Car Lighting Engineers this change in name of the association is a most important one.

A. J. Collett, of the Union Pacific Railroad, objected to the name suggested by Mr. Gilman on account of its length, and proposed instead the name of Association of Railway Electrical Engineers.

Several of the members expressed their views in favor of this change of name, agreeing that by so doing the scope of the association would be unlimited, both in membership and in work. Upon the motion of Mr. Collett, voting on the question was deferred until a later session to allow time for discussion.

MONDAY AFTERNOON SESSION.

The meeting was called to order by the president, who introduced J. Henry Klinck, of the Westinghouse Electric and Manufacturing Company, who addressed the convention on the subject, "The Application of Electricity to Railway Shops." Mr. Klinck said in part:

To deal successfully with electrical problems in connection with shop work as they occur in the motive-power department a man must have a rather wide experience. He must know what type of boilers and grates to install. He must be familiar with various kinds of fuel. He has to decide on the type of prime mover to use. The next thing before he comes to the electrical equipment proper is to make proper provision for compressed air, which is used almost universally in railroad shop work. He is next confronted with the problems involving heating and ventilation, water distribution and supply systems, and the proper type of unit for electrical generation. In regard to the electrical part of the problem we have, besides, the old familiar direct and alternating-current systems, their combination being either direct current in the main units with auxiliary alternating current, or the main units alternating current with an auxiliary direct system. From the experiences of large railroad shops the alternating-current plant is the type of plant to be installed, equipped with either rotary-converter or motor-generator sets to supply the buildings with the requisite amount of direct current. Direct current is necessary, in Mr. Klinck's opinion, for speed adjustment of motors. This speed adjustment is necessary on a great many tools. In a great many cases in connection with the shop work the question of changing of tools arises, and there has been a great deal of that done lately. It is impossible to take an old tool which was constructed so as to make a cubic inch of some material a minute with water-hardened steel, working at fifteen or less cuts per minute, and put on a motor of ten or fifteen horsepower and get three or four times the output. This method has been the cause of considerable trouble and disappointment in a number of cases. Mr. Klinck cited some results of the operations of tools under ordinary shop conditions, and illustrated the examples by means of curves which were distributed. The question of equipping railroad shops with electricity was taken up quite fully. While in only a few cases the use of electrical drive decreases the total operating expenses, yet it does materially decrease the unit cost—that is, a shop is able to turn out more work in the same time using electrical drive. The case of a railroad shop was given which had been operated very successfully with a steam plant, but when changed to electrical drive the output was increased to such an extent that the first cost of installation was soon covered. Mr. Klinck named many advantages of the electrically-driven shops, prominent among them the opportunity of increasing the power at any time in a simple way, providing the question of expansion was considered in the design of the power plant. Another important argument in favor of the use of the electric drive is the ability to use portable tools. In modern shops there is a great use for these tools, and the use of them is comparatively simple if motor-driven. There is also the advantage of the electric drive in being able to use overhead cranes freely. Those who have seen the old belt-driven cranes or air cranes can realize the importance of electrical cranes in the railroad shop of today. Another advantage is the ability to operate any particular section of any shop just when and how it is desired, without having to operate the entire shafting system, which may consist of a great many hundred feet of shafting. Mr. Klinck called attention to the classification of motors along lines of speed characteristics. This has a great many advantages and when understood will simplify the question of getting information, and also the handling of motors.

The discussion following Mr. Klinck's address was a spirited one. It was opened by F. E. Hutchinson, of the Rock Island lines, who asked Mr. Klinck what he finds with reference to variable-speed machines with multiple voltage with straight 220 and 110 volts and the free high voltage. Mr. Klinck in replying said that there have been a number of variable-voltage machines in many of the shops which work out very well, especially where there is a lighting system, but there is no need of using the two voltages for power only. If the adjustable-speed power is necessary it is advisable to use direct current.

The president then asked Mr. Klinck if it was the practice generally in railroad shops to use indicating instruments to obtain any information as to what the machines require or what the motors are doing, and if the motors are gauged accordingly. Mr. Klinck said the tendency was to use indicating instruments, but that these did not tell the whole story, as it is impossible to install them without being observed, and under these conditions an operator could do his work in accordance with his own speed views. If a recording instrument is installed on the

circuit and left there for a considerable length of time there is no trouble in finding out just what is going on. He cited a number of cases where the recording instrument accounted for mishaps which would have been otherwise overlooked.

C. R. Gilman asked whether Mr. Klinck could tell under ordinary conditions in a railroad shop if it would be more economical to equip with alternating current entirely or preferable to use direct current. Mr. Klinck could give no definite answer, saying that shops should be equipped according to conditions, in some cases alternating current being preferable, while in others direct current is preferable; however, it is the general practice to use alternating current with the provision for direct current for use on variable-speed motors.

The question of motors was discussed, several members giving the experiences they have had in the shops of the roads which they represent.

TUESDAY MORNING SESSION.

The meeting was opened at 10 a. m., and the report of the special committee on axle generators was read by J. R. Sloan, of the Pennsylvania Railroad, chairman:

The report covers three general subjects: design and construction of the axle generator proper and the auxiliary apparatus; the operation of the battery in connection with the axle generator; and the operation of the lamps. These three points are of interest to the operators of axle generators, as they directly influence the quality, reliability and cost of service. Thus, an axle generator of poor design and construction fails in service due to these defects. The arrangement of the pulley or sprocket when facing the end of the truck on which the generator is mounted should be on the right hand. The armature shaft should be removable from the armature core and commutator without disturbance of either of these parts. The armature cores should be composed of thin, annealed, laminated steel, and keyed to the armature shaft or spider. The commutator should be built of bars drop forged from Lake copper, the ear for attaching the windings being forged as part of the bar. Methods of insulation were taken up in detail. The armature coils should be form-wound, insulated with non-inflammable material. The leads of the armature coil should be securely fastened to the bar of the commutator bar. The coils should be held in the slots in the armature core by wedges. Band wires, when used, should have a strip of thin copper laid underneath them for the full circumference. The complete armature should be interchangeable for thirty to sixty-volt generators. The field frame should be of cast steel with laminated pole pieces securely fastened together and bolted to the frame. The two field frame and castings should, if possible, be interchangeable and reversible, so that the generator may be supported either from below or above. The bearings for both commutators and pulley end of shaft should be alike and interchangeable. The field coils should be wound with wire having a non-inflammable insulation and should be well taped and mechanically protected from the pole piece and frame by fiber or other similar material. The pole changer of the mechanical type should throw out of engagement after it has performed its function. If of the rotating type, it should be massive enough to prevent warping and binding. If of the electrical type, the coils should be wound with wire having a non-inflammable insulation, and the contacts should be of ample capacity for the current they are required to handle. In this manner all of the different parts composing an axle generator were taken up by the committee, and the rules for good practice stated so that by using the suggestions offered in this report a correct lighting equipment could be constructed and installed so as to give entire satisfaction.

Following the reading of the report, W. L. Bliss, chief engineer of the United States Light and Heating Company, of Milwaukee, Wis., read a letter giving his views of the matter taken up by the committee, which was supposed to have been incorporated in the report of the committee, but was received too late for publication.

Following the reading of Mr. Bliss' letter the members entered into a lengthy discussion concerning the axle pulley. The question of standard axles was also entered into, the discussion arising as to whether the straight or tapering axle was preferable. The report of the committee was then unanimously accepted.

TUESDAY AFTERNOON SESSION.

The report of the committee on standards was read at the afternoon session after an extended discussion as to the relative number of votes entitled to the representatives of the railroad companies and the Pullman Company. It was finally decided that for each car operating over a railroad on the mileage basis, and maintained as far as the lighting equipment is concerned by the Pullman Company, should be given one-half vote:

The report of the committee on standards consisted of fourteen recommendations, principal among them being the following: The standard voltage for head-end or straight storage car lighting be made sixty-four volts (nominal); the standard voltage for axle power lighting should be made thirty-two volts (nominal); on all terminal connections on switchboards, regulators, generators, batteries, train connectors, the positive pole must be on the right, facing the same; all cars should be provided with overhead train-line connection of three wires; all wires at terminals should be marked for identification and polarity; the three-finger type of connector is recommended; a suitable vent for battery boxes must be placed in the battery-box door; an approved dustproof bushing through back or end of battery box must be provided for leading-in wires, unless a conduit system is used; an approved single-pole fuse box must be placed in the positive side of the battery circuit; battery boxes should be made of wood suitably secured by iron straps to body of car; all parts of the suspension gear or generator, when car is on a level-straight track, must have at least a clearance of six inches from the top of the rail; the suspension gear should be so designed that the armature can be easily removed; the straight pulley seat should be provided for securing the axle pulley to the axle; if a bushing is used it should be secured to the axle independent of the pulley and of such length as will allow two inches lateral adjustment of the axle pulley on the bushing.

These recommendations were taken up, separately discussed and voted upon, and in nearly every instance accepted by the association.

The report of the Wednesday and Thursday sessions of the convention will be given in next week's issue.

Richmond Light and Railroad Company.

The New York Public Service Commission has issued an order approving the application of the Richmond Light and Railroad Company for authority to lay tracks on Wadsworth Avenue, Borough of Richmond, a street running from New York Avenue to Tompkins Avenue, a distance of 1,476 feet. It is the purpose of the company to substitute a private right-of-way for that section to their South Beach line, which line runs through the United States Government reservation on Staten Island, the change being made necessary by direction of the government to the company to remove its tracks on New York Avenue to Richmond Avenue, as the government contemplates very extensive improvements.

Illinois State Electric Association.

It has been decided to hold the annual meeting at Alton, Ill., on October 26, 27 and 28. H. E. Chubbuck, secretary of the association, states that all indications point to a good attendance. The meeting will be held at the Illini Hotel, and supply houses will make displays which, with the special papers by members, will make an interesting session. Mr. Chubbuck's invitation announcing the meeting says, "Come early and stay late." It is known that much interesting data on lighting rates will be submitted.

Telephones in Cuba.

The recent decree of the Cuban president, Gomez, giving the Cuban Telephone Company the right to operate local and long-distance lines in all parts of the island, is the most important concession granted by the present government and marks the end of a long struggle for the modernization of the telephone system in Havana.

The company expects within a few months to place all wires underground.

Interesting Electrical Developments in Mexico.

The large benefits that have been accomplished through the introduction of electric power in mining operations in the districts of Guanajuato, El Oro and Pachuca, Mexico, have given a great impetus to the installation of electric power plants in different mining sections of that country. The largest of these plants is that which a Canadian syndicate, headed by Dr. F. S. Pearson, is preparing to erect on the Conchos River, near Santa Rosalia, state of Chihuahua, and which will generate power for transmission to the mining districts of Santa Eulalia and Parral. Many smaller hydroelectric projects are on foot. The Mines of Mexico Company, of Denver, Colo., which obtained a concession from the Mexican government several months ago for the installation of a large hydroelectric plant on the Mayo River, in the state of Sonora, has had the surveys made for the proposed plant and necessary dams, and the active work of construction will soon be started. The sites for three dams were located. The plant will be located near Alamos. Other projects on foot may be noted as follows:

José Enriquez Guzman will soon begin the erection of a hydroelectric plant on the Altar River, near Altar, state of Sonora. The electric power will be transmitted to towns and industrial plants in that region.

Chapala Hydro-Electric and Irrigation Company has obtained a loan of $2,200,000, which will be used to erect a new hydroelectric plant at Puente Grande, on the Santiago River, near Guadalajara, and in the construction of transmission lines to the mining districts of Etzatlan and Hostotipaquillo. The company has also obtained a loan of $3,000,000 from the federal government. The latter sum will be used to build a dike across a portion of Lake Chapala and in the construction of an extensive system of irrigation canals and ditches.

Adolfo Fartinez has obtained a concession from the federal government for the installation of a hydroelectric plant on the Quetzalpa River, state of Hidalgo. He has had surveys made for the proposed plant, and it is claimed that 10,000 horsepower can be generated.

Jose Riaz Rubin, who recently obtained a concession from the federal government for the utilization of the water in the Matamoros River for generating electric power, is preparing to build a dam across the stream and install a hydroelectric plant.

The Guanajuato Reduction and Mines Company has begun the construction of an electric railway which will run from its Las Playas mines to the yards at Tepettaya. The road will do a freight business exclusively, and will be one of a number of electric mining roads in the Guanajuato district.

Pinchot Still Suspects a Power Trust.

Gifford Pinchot, chief of the Bureau of Forestry, still asserts that a monopoly is now in progress of formation whose object is to obtain possession of the waterpower sites of the country. He declares that remedial legislation must be enacted at the coming session of Congress if this great natural resource is to be preserved to the people.

The problem of how best to prevent the nation's waterpower sites from being gobbled up by such combinations, Mr. Pinchot predicted, will be one of the biggest issues which the next session of Congress will have to thrash out. While he stated that the alleged trust is now only in the formative stage, Mr. Pinchot declared that prompt action on the part of Congress is necessary to throttle it. On the proper solution of this question the future happiness of a great many people rests, he said.

After declaring that "there is a waterpower trust certainly in process of formation," Mr. Pinchot, in a recent interview in Washington, said:

"In my judgment the tendency to consolidation which is now running through all industrial enterprises, will necessarily in the end lead to the consolidation of the waterpower interests, exactly as it has to consolidation of steel and oil interests. There has got to be legislation on this waterpower business. President Taft has indicated his intention of asking Congress for legislation governing, as I understand it, the disposal of waterpower sites on the public domain. The question is, are we going to give these power sites in perpetuity? That is a question with which Congress will have to deal."

Electrification in Australia.

The New South Wales Railway Commissioners, it is reported, have decided to electrify the remaining forty-three-and-one-half miles of suburban steam lines running out of Sydney. A total of 146 miles of single track have been electrified during the last nine years.

Chief Engineer of the Panama Canal Inspects the Necaxa, Mexico, Dam Break, Seeking Pointers.

(Special to the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.)

Mexico City, Mexico., October 2.—Colonel George W. Goethals, U. S. A., chief engineer of the Panama Canal, has arrived here for the purpose of investigating the possible causes leading up to the disaster which occurred a short time ago to the great dam at Necaxa, ninety miles from this city. This dam is being built by the Mexican Light and Power Company, a Canadian concern which has invested more than $40,000,000 gold in the erection of hydroelectric plants and power systems for supplying this city and other places within a radius of 150 miles of Necaxa with lights and power.

The visit of Colonel Goethals is of much significance, as his investigations at Necaxa may have an important bearing upon the construction of the Gatun dam. He admits this fact. He says that the two dams are being constructed along the same lines. The disaster at the Necaxa dam was caused by a slip in the clay and sand, causing damage amounting to upward of $1,500,000. Colonel Goethals says that he wants to find out what caused this slip. Since the accident occurred many eminent engineers of the world have criticized the type of construction of the Gatun dam, claiming that a similar disaster is likely to be met with there. The same engineer who planned the Necaxa dam also has charge of the work of supervising the construction of the Gatun dam, and this has added to the criticism, Colonel Goethals says.

The Necaxa dam, when finished, will be the largest dam on the North American continent. It will be 165 feet high and will contain 2,000,000 cubic yards of material. The material is carried to the dam site by means of flumes, being mixed with water. The water runs off and the clay and sand are deposited in the proper place. The clay finds its way to the center, being the heaviest, and forms a solid barrier to the pressure of the water in the reservoir which the dam forms. The dam was of insufficient strength to hold the pressure of the water and the wall of clay and sand slipped out. The repair of reconstruction of the dam is now being carried on by the method originally used. This same method is used in the construction of the Gatun dam. The engineering world is more than interested in the outcome. N.

The Development of Niagara Falls.

It was seventeen years ago last Monday that the Cataract Construction Company broke ground for the tunnel power development in Niagara Falls. This incident occurred at the corner of Falls and Erie streets and was attended by a large crowd. It is barely possible that the development which resulted has not been so great as was then predicted by the several enthusiastic speeches of that happy time, but it is evident that the promoters were bold in their conception, even though their conclusions of those comparatively early times have been well approved and supported by practice. The tunnel development brought Dr. Edward G. Acheson, Charles M. Hall and other inventors to Niagara Falls to enjoy the electric power facilities, and this has given that locality great, busy plants, the like of which are unknown in other parts of the world. Two decades have not yet passed, and still the development has been encouraging. The two former villages have been developed into cities, and a population of a little over 11,000 has been increased until the city of Niagara Falls proudly boasts of between 30,000 and 40,000 residents, a number increased on many summer days by the tourist and excursion influx to 50,000.

And then the spirit of development has not yet ceased. Several of the great industries at Niagara are even now enlarging. The Carborundum Company has a splendid four-story structure under way adjoining its office building on Buffalo Avenue. The Aluminum Company of America has only this year placed its great No. 3 plant in operation. The International Acheson Graphite Company is completing a large addition to its plant on the New York side and increasing the output capacity and size of its Canadian works. The Development and Funding Company displays wonderful building activity, its plant now being very large. While seventeen years have rolled along, they have been years of wonderful strides for Niagara, with more and better things to come, perhaps, for many important projects are hovering about Niagara with a view of locating there. E.

Bell Telephone of Buffalo.

The stockholders of the Bell Telephone Company, of Buffalo, N. Y., have voted unanimously to sell the property of the New York Telephone Company. This is the last of the seven Bell companies of New York State to be merged.

Pittsburg Section, American Institute of Electrical Engineers.

The regular September meeting of the Pittsburg Section, American Institute of Electrical Engineers, was held in the Carnegie Institute on September 14, Chairman W. Edgar Reed presiding. Previous to the meeting the usual social dinner was held at the University Club.

The annual election of officers for the ensuing year was held, resulting as follows: Chairman, C. B. Auel; secretary, E. B. Tuttle; executive committee, W. E. Reed, W. E. Moore, H. M. Muller, Ludwig Hommel, R. A. L. Snyder and B. P. Rowe. A vote of thanks was given to the retiring officers, whose faithful and efficient service had made the past year such a successful one in the history of the Pittsburg Section.

The subject of the evening was "Industrial Motor Applications," and three original papers were presented and discussed. These were as follows: "Operation of Industrial Motors for Rolling-Mill Service," by H. C. Specht, of the Westinghouse Electric and Manufacturing Company; "The Direct-Current Motor in Industrial Work," by F. A. Rew, of the Westinghouse Electric and Manufacturing Company; "Motor Applications in the United States Navy," by W. O. Peale, of the Westinghouse Electric and Manufacturing Company.

The papers were discussed by Prof. V. Karapetoff, of Cornell University, and by C. W. Drake, B. Wylie, R. S. Feicht, W. Sykes, R. P. Jackson, C. B. Auel, and B. P. Rowe, of the Westinghouse Electric and Manufacturing Company.

The next meeting of the section will be held on October 12, when an original paper on "Electric Welding" will be presented by C. B. Auel.

Trolley Service for Queensboro Bridge.

Application has been made to the Board of Estimate by Bridge Commissioner Stevenson for permission to transfer certain appropriations for his department to enable the immediate establishment of a temporary municipal trolley line over the new Queensboro Bridge, New York city. It is proposed to rent cars from the South Shore Traction Company and to buy power from the New York Edison Company. The temporary line, which is to be operated until the franchise question is settled by the courts, is expected to yield a slight profit at the proposed fare of three cents or five cents for a round trip.

Electrification Tests in France.

Experiments are being carried out in France by the Paris-Lyon-Méditerannée Railway, with a view to converting the Cannes-Vintimille section of its line from steam to electricity. The experiments are being made on the Grasse-Mouans-Sartouse section, which is very convenient for the purpose, as it includes some of the steepest grades and sharpest curves, and is also not crowded with traffic.

The tests are being made with a trolley wire, it being suspended flexibly by means of a system which does not involve the use of separate suspension wires. Wooden poles are used at present, but these are to be replaced by metal lattice-work supports later on.

The locomotive used weighs 140 tons, and is approximately the same length as the steam locomotive in use on the road, including the tender. There are eight axles, of which the four central ones are driving axles with large wheels.

The overhead line is supplied with single-phase, alternating current at 12,500 volts, which is converted on the locomotive by means of a special permutator into a direct current at a voltage adjustable between zero and 600 volts at will.

There are four motors of the ordinary direct-current type, of 450 horsepower each, to a locomotive, geared to the driving axles.

The total draw-bar pull exerted by the locomotive is 16,400 pounds at a speed of thirty-seven miles per hour and 10,600 pounds at a speed of sixty-two miles.

Norwich & Westerley Receiver.

The appointment of United States Senator Frank B. Brandegee as receiver of the Norwich & Westerly (Conn.) Street Railway Company is intended to help facilitate the reorganization of the corporation. The company has defaulted the interest on its bonds and is trying to reorganize on a basis by which the fixed charges will be materially reduced. Holders of $500,000 of the bonds and about two-thirds of the creditors have assented to the tentative scheme of reorganization proposed by the officials of the company, and it is expected that further assents will shortly be received.

The receivership is a friendly one, and will probably be soon terminated if the readjustment plans do not encounter any serious hitch. The appointment of Senator Brandegee was made by the United States Circuit Court.

Another Subway Route for New York City.

It is learned that the New York Public Service Commission engineers have worked out the details of a new subway route, not heretofore announced, which will provide an outlet for the new Pennsylvania station at Thirty-second Street, Manhattan Borough, New York city, and will also make use of the Queensboro Bridge and provide a rapid transit route from the Borough of Queens.

The route starts at the Battery and lies through Greenwich or Washington streets to the vicinity of Chamber Street, thence up Hudson Street to Eighth Avenue, up Eighth Avenue to Fifty-ninth Street, crossing Fifty-ninth Street to the Queensboro Bridge, over the bridge and continuing as an elevated line along Jackson Avenue in the Borough of Queens. It is also contemplated that extensions will be built in the direction of Corona and Flushing and possibly also in the direction of Astoria. The plans call for four tracks south of Fifty-ninth Street, with two tracks in Fifty-ninth Street, crossing the bridge on the elevated structure already erected on the bridge.

The engineers have reported that the route is entirely feasible from an engineering point of view, the chief difficulty being in a rather steep grade to reach the elevated tracks on the Queensboro Bridge, a grade of 5.7 per cent being provided at the western approach to the bridge. The Commission has not yet formally adopted the route, but it is expected that it will very soon take such action and send the plans to the Board of Estimate and Apportionment for approval. The method of construction, whether by public money or by private enterprise, is not yet decided and that would rest with the Board of Estimate in any event.

The proposed route of the Hudson Street, Eighth Avenue and Fifty-ninth Street subway would not conflict in any way with the proposed Broadway-Lexington Avenue subway. No announcement has been made as to the likelihood of the Interborough's bidding for this latest proposition, but the Interborough officials have repeatedly urged the importance of the extension of this West Side line downtown so as to accommodate the traffic from the Pennsylvania terminal. These suggestions have heretofore been for an extension down Seventh Avenue from Times Square, but the route now proposed would connect with the subway at Eighth Avenue and Fifty-ninth Street.

The Purchase of Coal on a Heat-Unit Basis.

A recent report to the mayor of New York by the Commissioners of Accounts contains many live facts regarding the purchase of coal on a heat-unit basis. This method of purchase would be an incentive to the dealers to furnish coal of superior quality if only on account of the obvious saving in hauling and handling charges when the price is fixed according to the number of heat units developed by the coal for a given weight. An example illustrating the purchase of coal by weight and by thermal value shows that on a bid of 80,000 tons of anthracite coal for one city department in the year 1905 there were three bidders, at prices, $6.50, $6.10 and $6 per ton, respectively. The highest priced coal had a heating value of 13,000 British thermal units per pound, and the others 11,000 and 10,500 units, in order, while the percentages of ash were twelve, eighteen and twenty-four, respectively. Assuming that the cheapest coal would do the work satisfactorily, then but 64,675 tons of the dearest coal would be equivalent in heating value to the 80,000 tons of this cheapest coal, and 76,363 tons of the intermediate quality would also give the same number of heat units. At this rate the dearest coal would cost $419,998, the next dearest $465,814, and the cheapest $480,000. Thus the coal which costs most per ton actually costs $60,002 less than the cheapest coal, on the 80,000 tons order, for the number of heat units developed, and this not taking into account the saving in transportation, handling, storage, and the disposal of the ashes, all of which would add very materially to the ultimate economy.

Telegraphy in Brazil.

Consul-General George E. Anderson, of Rio de Janeiro, reports that the Brazilian Government has made a contract with a French telegraph company for the construction of a wireless station on the island of Fernando Noronha, 200 miles east of the coast of Rio Grande do Norte, and 400 miles from Pernambuco, the nearest large Brazilian port, with auxiliary stations at Pernambuco to connect the island station with the Brazilian telegraph system, and at such other points as may be needed. The island station will have a radial activity of 1,000 miles, approximately half-way across the Atlantic from that point, and reaching as far south as Bahia and at least as far north as Maranhao.

The Improved Trolley Car.

The equipment of a train on the Cedar Rapids and Iowa City interurban line gives a good idea of the perfection of the same given on the best interurbans of the country. The latest train of this company consists of two cars each sixty feet long, one of which is exclusively a passenger coach, and the other is a combination passenger, smoker, express and mail car and also the motor car for the train. The passenger coach is attached to this car exactly as one vestibuled Pullman is coupled to another, making a vestibuled train of two cars. The passenger coach seats 118 passengers. It is a model of convenience and comfort. The interior woodwork is mahogany and the seats are of green plush much like those of the other passenger coaches of the company. But the seats are considerably wider, wide enough for two big men to sit in them comfortably, and for three to sit in case of a crowd, such, for example, as a football crowd. The windows are double like those of a Pullman car. There is a large brass rack over each seat for hats and parcels. The ventilators are of artistic design and filled with art glass. There is a row of incandescent lights down the middle of the ceiling directly over the aisle.

In addition to this there is a wall bracket and lamp for each seat, just at the height for comfortable reading. There are two toilet rooms in each car with cement floors and other equipment equal to that found in first-class Pullmans for railroad service.

In the motor car a large section is finished and equipped as above described. Forward from this is the smoking compartment which is finished in quarter-sawed oak with a mission stain and has rattan seats. In the front end of this car is a compartment built specially for the motorman, and the rest of the space is occupied by the hot-water heater and the baggage and mail facilities.

The motor is very powerful and can haul several cars if necessary. As an example, the regular interurban car was attached to the rear end of the new train, and the motor brought up the three cars with ease, taking the grades with no trouble whatever. The tendency is all for longer trains.

Dean Electric Company Absorbed.

The Kellogg Switchboard and Supply Company, of Chicago, has absorbed the Dean Electric Company, of Ohio.

Mr. Edison and Dr. Steinmetz.

On the occasion of the convention of the Association of Edison Illuminating Companies at Briarcliff Lodge, N. Y., Tuesday, Wednesday and Thursday, August 30, September 1 and 2, one of the features of the meeting, as already mentioned in an earlier issue, was the dinner tendered Mr. and Mrs. Edison. The gathering was unique in that a large number of those who attended the banquet had their start in the laboratory of Mr. Edison. Among those felicitating Mr. Edison and the association upon this occasion was Dr. Charles Proteus Steinmetz. In many ways Dr. Steinmetz stands head and shoulders over any living exponent of electrical development,

DR. STEINMETZ AND MR. EDISON.

and it was in a peculiarly happy vein that he paid his tribute to Mr. Edison as the genius who had made possible the existence of the association.

Anyone who is at all familiar with the meetings of scientific bodies, particularly the conventions of the American Institute of Electrical Engineers and the National Electric Light Association always remembers the versatility of Dr. Steinmetz and the readiness with which he discourses upon any conceivable topic.

We are fortunate in being able to reproduce a photograph of these two great electrical men of today, in characteristic attitudes—Dr. Steinmetz talking, and Mr. Edison listening. The photograph was taken on September 2 at Briarcliff Lodge. For its use thanks are due Leavitt L. Edgar, of Boston.

Chicago Electric Club.

Dana Pierce, electrical engineer, with the Underwriters' Laboratories, Incorporated, was the speaker at the Chicago Electric Club on Wednesday, September 29, following the regular midday luncheon. Mr. Pierce gave a general review of the routine work carried on by the laboratories. He discussed their relation to insurance interests and to manufacturers and consumers. He also explained the existing methods of obtaining approvals of electrical devices and materials and the manner in which the results of the work of the laboratories are announced.

Starting with the origin of the laboratories, some sixteen years ago, Mr. Pierce outlined their rapid progress up to the present day, comparing reports made in earlier years, when both the manufacturer and the laboratories were uncertain as to the steps the other would take, with the reports in recent years which either finally approve or condemn the devices. The work of the laboratories is confined to investigations having a bearing upon the fire hazard and is undertaken as one means of securing correct solutions of many of the problems presented by the enormous and disproportionate destruction of property by fire in the United States.

The aim of the founders of the Underwriters' Laboratories was to secure the fairest and best opinion regarding the merits or demerits of every device, system, or material having a bearing upon the fire hazard, and to have the work so conducted and reviewed as to secure accuracy and uniformity in its findings, and this aim has been achieved, asserted Mr. Pierce, to such an extent that the majority of fire underwriters in the United States, many municipal authorities and a large number of architects, building owners and users either accept or require a report from the Underwriters' Laboratories incident to their recognition of devices, systems or materials having a bearing upon the fire hazard.

Summaries of the reports of the laboratories are promulgated on printed cards filed according to classifications, and copies of these cards are maintained at the offices of the principal boards of underwriters in the United States. Much of the information is also freely distributed by means of lists of approved devices.

Mr. Pierce outlined a number of interesting experiments that had recently been made at the laboratories, and also told of a number that were soon to be made.

Preceding the address of Mr. Pierce Wm. S. Taussig, secretary of the club made the announcement that Frederic P. Vose and Homer E. Niesz had been chosen president and vice-president, respectively, Mr. Vose to fill the position made vacant by the resignation of C. A. S. Howlett.

American Institute of Electrical Engineers.

The October meeting of the American Institute of Electrical Engineers is announced for Friday, October 8, at 8 p. m., when a paper on "Telegraph and Telephone Systems as Affected by Alternating-Current Lines" is scheduled to be presented by John B. Taylor, of the General Electric Company, Schenectady, N. Y. The report of this meeting will be given in our next issue.

The November meeting is announced for Friday, November 12, at 8 p. m., when Dr. Cary T. Hutchinson, consulting engineer, of New York city, will read a paper entitled "The Electric System of the Great Northern Railway Company at Cascade Tunnel."

The Edison Electric Illuminating Company, of Brockton, Mass., has recently moved into a new office. The building is outlined with electric lamps. There is also a mammoth electric sign installed on the roof. This display is a good example of electric advertising at home.

Western Association of Electrical Inspectors.

A preliminary announcement of the fifth annual meeting of the Western Association of Electrical Inspectors has already appeared in these columns. The programme of reports and topics to be considered is now fairly complete, and is given herewith in condensed form. The association's sessions will be held in the Employers' Association Hall, Stevens Building, Detroit, Mich. The dates are October 26, 27 and 28. The meetings will begin promptly at 10 a. m., but it is arranged to have a series of inspection tours preceding all the sessions after the first one.

The programme is substantially as follows:

Address by President George D. Bayle, report of executive committee, report of secretary and treasurer, new business, appointment of nominating committee; reports from the following committees: Uniformity in Rulings, Grounding of Conductors for Safety, Public Safety; address by Alexander Henderson on "The Effect of Inspection on the Manufacture of Electrical Appliances;" address by J. B. McCarthy on "The Technical Press and Its Relation to Electrical Inspection Work;" discussions on the following topics: "Metal Molding," "Illuminating Engineering," "Difficulties Arising in Electrical Inspection Work;" reports from the following committees: Architects' Specifications, Instructions to the Public Concerning the Safe Operation and Maintenance of Electric Wiring, Laws and Ordinances, Installation and Operation of Induction Motors, Construction and Installation of Electric Signs, Show Window and Display Lighting, and finally a general discussion on the inspection tours.

On the evening of October 26 an informal dinner will be given to the members. At this the principal address will be made by James E. Cole, of Boston, his subject being "Municipal Control of the Electrical Hazard."

General Electric and Westinghouse Companies Patent Agreement.

It is understood that the General Electric Company is working on a new agreement with the Westinghouse Electric and Manufacturing Company, which will be substituted for the present patent agreement which became operative in 1896 and expires in 1911.

The present agreement provides for an exchange of licenses so far as patents are concerned, between the General Electric Company and the Westinghouse Electric and Manufacturing Company.

Special Census Agents for Manufactures.

Census Director E. Dana Durand announces November 3 next as the date for making a practical test of the qualifications of applicants for appointment as special agents for the collection of the thirteenth census statistics of manufactures and mines and quarries. Blank applications may be obtained now by writing the Bureau of the Census, Washington, D. C. No applications which are received after the close of business October 25 will be considered.

In a circular of instructions relative to the subject the director states that about January 1, 1910, the bureau will employ from 1,600 to 1,800 special agents. As far as possible it is desired to obtain for this work persons who have had college or university courses in statistics or economics, and persons who have had service in the accounting department of some manufacturing or other business establishment.

When an application is complete in every particular it should be mailed to the Director of the Census, Washington, D. C.

The duties of special agents will consist in obtaining, in person, from manufacturing establishments and mines and quarries, the statistics required by law, as indicated in the printed schedules with which they will be furnished. These statistics cover investment, quantity and value of products and of raw materials used, number of employes and their wages, character and quantity of power, etc.

The special agents will be divided into two classes: Class 1, chief special agents, who will collect statistics and supervise the work of assistant special agents within a given territory or district; and Class 2, assistant special agents, who will be assigned to the collection of statistics under the direction of, and subordinate to, special agents of Class 1.

Chief special agents of Class 1 will receive compensation at the rate of from $4.50 to $6 per day, including intervening Sundays. Assistant special agents of Class 2, if paid by the day, will receive from $3 to $4 for each day, including intervening Sundays; but such agents may, however, be compensated on a piece-price basis.

Copper Exports.

Exports of copper for the week ended September 30 were 7,470 tons. Since September 1 they were 20,057 tons, compared with 19,378 tons the same period last year.

New York Interborough's Passenger Traffic Makes Wonderful Record.

The New York Interborough Rapid Transit Company broke all previous traffic records Thursday of last week, when 2,157,989 persons were transported over its lines, of which 1,121,207 were elevated passengers and 1,036,782 subway. These figures eclipse last Saturday's record when 2,140,521 passengers were carried over the Interborough system.

Thirteen millions of passengers, to be exact, 12,964,716—is the record in transportation which the Interborough Rapid Transit Company has reported as having been set by its subway and elevated lines in seven days, from September 25 to October 1. This count did not include Saturday's tally of passengers, which is thought to have been greater than that of any other day of the Hudson-Fulton celebration.

The company officials think that on Saturday, October 2, 2,250,000 or more passengers paid their fares—the count has not yet been completed—thus bringing the number of passengers carried in the eight days of the big show up to 15,000,000. Besides those who paid to ride, the company had issued 10,000 passes to the officers and men of the visiting fleets and to the accredited delegates from other countries; how many took advantage of these cannot be determined.

Westinghouse Company's Dividends.

As a result of the rapid increase in business this year, dividends on the preferred stock of the Westinghouse Electric and Manufacturing Company have been resumed by the declaration of a quarterly dividend of one-and-three-fourths per cent and three-and-one-half per cent on account of the twelve-and-one-fourth per cent back dividends accumulated since the company went into the hands of a receiver during the panic of 1907.

There is $3,998,700 cumulative preferred stock outstanding, which shares equally with the "assenting" stock in all disbursements after seven per cent has been paid on the latter issue. On this basis the preferred received ten per cent annually from 1903 to October, 1907, just prior to the receivership. During the receivership, as part of the reorganization plan, the "assenting" stock was increased from $46,000,000 to $56,000,000 and $6,431,950 was issued to creditors along with $3,635,000 convertible five per cent bonds in satisfaction of the claims of the creditors.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

ILLUMINATING ENGINEERING SOCIETY.

THIRD ANNUAL CONVENTION, NEW YORK CITY, SEPTEMBER 27, 28 AND 29.

Under circumstances which, to say the least, lent great aid to the subject of lighting, the third annual convention of the Illuminating Engineering Society began on Monday morning, September 27, at the Engineering Societies Building, New York city, just two days after the opening of the Hudson-Fulton Celebration. Needless to say, this celebration will long be remembered for its lighting rather than any other feature.

MONDAY MORNING SESSION.

Unfortunately, the New York members were so taken up with work on the celebration that they were not much in evidence at the first session, which the chairman of the convention committee, E. L. Elliott, opened shortly after 10:30 a. m. The visitors were made welcome by T. C. Martin, who aptly stated that while Paris was the "City of Light" in the old world, New York was the "City of Light" in the new; and Dr. Louis Bell, who responded to the welcome, said that it takes New York a good while to wake up, but when she does, it is with great enthusiasm.

The president, W. H. Gartley, in his presidential address, only an abstract of which was presented, referred chiefly to visual perception, and his remarks, when fully published in the society's *Transactions*, will bear careful consideration. Regarding the position of illuminating engineering, he said that the fact that some 250 million dollars for lighting were spent each year in this country would seem to be an answer to the query as to the need for work along the lines which the society was following. The society has brought about a higher standard of illumination in both gas and electric lighting, and is actively supported by both these industries. We need, however, the aid of the trained physicists in our colleges, and such interest as they have already taken speaks well for the future.

In presenting the report of the committee on nomenclature and standards, the chairman, Dr. A. C. Humphreys, spoke briefly of the work in hand and referred to the chairmen of the sub-committees for the detailed reports.

The report of the sub-committee on unit of light was presented by Dr. E. P. Hyde, at the request of its chairman, Dr. Louis Bell. Dr. Hyde reviewed briefly the work which has been accomplished toward the adoption of the international candle by the United States, Great Britain and France, which we have referred to in earlier issues. It seems that there has been considerable discussion, especially in Germany, concerning the adoption of an international unit, but without an international standard with which to make a comparison.

In this connection, Dr. A. H. Elliott stated that he had taken personally six carbon-filament electric lamps to the Electrical Testing Laboratories in New York city, the Bureau of Standards at Washington, the official laboratories at London and Charlottenburg, and then back to Washington, and although the final figures were not available, the results showed a much better agreement than he had anticipated.

Dr. E. B. Rosa called attention to the fact that the International Photometrical Commission would meet in Zurich next year, and as yet America had no representative, although England, Germany and France had several.

The other report referred to by Dr. Humphreys, viz., one on photometric units, was presented by Dr. C. H. Sharp, the chairman, but not in final form, as some of the minor details have not yet been decided by the committee. He said that the proposals were based upon the celebrated work of Doctor Blondel. The unit of luminous flux will undoubtedly be based on the unit solid angle or steradion $\left(\frac{1}{4\pi} \times \text{M. S. C. P.}\right)$, that is, unit mean spherical candlepower divided by 4π.

Doctors A. E. Kennelly, L. Bell and E. P. Hyde spoke in favor of the centimetre-gramme-second system of measurements being adopted, as they were already international in character. Doctor Rosa said that, if we would give up the foot and adopt the metre, the Germans would be likely to give up the hefner in favor of the candle (laughter). After further discussion by Messrs. Gartley, Marks and Bond, the subject was closed.

Secretary Preston S. Millar then announced that a number of invitations had been received, among which were those of the Consolidated Gas Company and the New York Edison Company, to visit their works; and from the American Society of Mechanical Engineers to visit its historical exhibit on the Hudson-Fulton Celebration.

After reports from the chairmen of the committees on entertainment and exhibits, Messrs. Marshall and Elliott, the meeting adjourned.

MONDAY AFTERNOON SESSION.

Although the day opened with cloudless skies by afternoon it began to rain, so that the attendance at the second session was not what it should have been.

President Gartley called the meeting to order promptly at 2:30 o'clock and introduced E. L. Elliott, who read his paper on "The Ethics of Illuminating Engineering."

In this paper Mr. Elliott outlined an admirable code of ethics for illuminating engineers. He spoke of the need of furnishing the genuine illuminating engineer with some authoritative credentials to distinguish him from the quacks. As to fees from clients he regards as self-evident that compensation must be based upon competence. The value of the services to the client must also be taken into account, but not on a contingent basis. An illuminating engineer in the employ of a lighting company or lighting appliance company should not do a general consulting business, as his judgment is biased. As regards professional relations illuminating engineers should not openly criticize the work of their competitors; in fact, they should do all in their power to advance the standing of the profession and the knowledge of the illuminating art.

In the discussion L. B. Marks stated that although a college education was desirable it was not essential, and that an engineer could accept a retainer from

manufacturers of appliances and also do consulting work.

Mr. Campbell described the practice of basing the fee upon the saving on lighting bills and hoped that this practice would be frowned upon.

Mr. Calvert thought that the advice given by lighting companies was tending to encroach upon the work of regular practitioners, and in reply H. T. Owens stated that it was fortunate that the lighting companies took an interest in the subject, as any increase in the number of good installations would greatly aid all concerned.

Norman Macbeth said that the greatest trouble so far experienced was from salesmen who were pushing their wares under the guise of illuminating engineers.

In closing the discussion Mr. Elliott said that any advice given by an engineer interested in a certain appliance should be confined to that particular system and not include any others, as he was manifestly unable to give impartial advice in the latter case.

The second paper was presented by Geo. S. Barrows on "The Work of Dr. Carl Auer von Welsbach in the Field of Artificial Illuminants."

This paper was devoted chiefly to a description of the development of the incandescent gas mantle which rightly bears its inventor's name. About 1880, while a student at the University of Heidelberg, Dr. Auer had his attention directed to the luminescent properties of the rare earths. After several years' experimental work he announced his invention of the mantle in 1886. Commercial difficulties developed till 1890, when the mantle was perfected as the result of Dr. Auer's individual work. About 1898 he produced his first osmium incandescent lamp filament, which was the first of the metallic filaments and would have had a greater commercial future but for the invention subsequently by others of the tantalum and tungsten filaments. Lately he has made a study of pyrophoric substances for igniting gas.

Dr. A. Simonini, who had been associated with Dr. Auer, spoke briefly of the great work which the latter had accomplished.

Dr. A. H. Elliott stated that his work on pyrophoric or sparking alloys had already borne fruit as they were being used extensively in Germany for gas lighting.

Dr. Myer said that as early as 1906, some 400 tungsten lamps a day were being made in Dr. Auer's Vienna factory for commercial use.

Dr. C. H. Sharp called attention to the fact that the two great modern systems of illumination, incandescent gas and incandescent electric lighting, were one-man systems, Dr. Auer's and Mr. Edison's.

Dr. Louis Bell referred to Dr. Auer as one of the greatest and one of the least recognized of research chemists.

The paper on "The Progress of Illuminating Engineering in Europe" was then read by H. Thurston Owens.

Illuminating engineering is as new in Europe as it is here, says Mr. Owens in his paper. It has become prominent within the past two years largely because of the work of Leon Gaster in his journal, his Cantor lectures and his organization of the British Illuminating Engineering Society. Mr. Owens thinks that we are much behind Europe in the adoption of high-powered luminants. He cited many large installations of flaming arc lamps and high-pressure gas lamps. Berlin, he regards as a model for public lighting. London is brightly lighted but has a great variety of systems. Paris seems to be less deserving of its title, "City of Light," than formerly. Gas is used more extensively throughout Europe, and gas fixtures are more artistic than here. Maintenance receives greater attention, and it is seldom one sees broken mantles or dirty bulbs.

In discussing the paper Dr. A. H. Elliott agreed most heartily with the author regarding the matter of maintenance and hoped that both gas and electric companies would give the matter greater attention.

G. S. Barrows stated that he did not believe that America was so far behind Europe, especially in electric lighting, and that as far as high-pressure gas lamps were concerned the American manufacturers have been ready for some time to supply the demand, but that the field was covered by electric arc lamps.

In closing, Mr. Owens stated that he hoped Mr. Barrows would be fortunate enough to visit Berlin and see the results obtained with the latest designs of electric lamps. Regarding the high-powered electric lamps, which Mr. Barrows claimed were so good, these should be displaced by either newer types of electric or high-pressure gas lamps, as they have been abroad.

The next paper was entitled "Diffusing Mediums," by A. J. Marshall.

This paper is devoted to a strong criticism of the use of ground or roughed glass balls as a diffusing medium for high-powered luminants. These do require to be diffused, but the kind of balls so commonly used meet the hygienic requirements only partially, and the æsthetic requirements not at all. The brilliant source is very prominent in the center of such a ball. The only excuse for the use of ground or roughened glass is its cheapness and low absorption. At the slight sacrifice of each of these it is possible to use clear or slightly tinted opal globes, which Mr. Marshall regards as excellent diffusers that at the same time give a rich and beautiful effect. The author made also other excellent suggestions.

Messrs. Hopton and Marks discussed the conditions under which ground glass could be used to advantage despite the interdictions of the author to the contrary.

P. S. Millar stated the practice of manufacturers in supplying photometric data with their lighting appliances could well be amplified by including the intrinsic brilliancy and the character and amount of absorption.

The concluding paper of the session was that by F. K. Richtmyer on "Illuminating Engineering from the Educational Standpoint." It was read by E. L. Elliott in the absence of the author.

The object of the paper was to stimulate discussion of the technical education that should be given an illuminating engineer. The technical schools should provide not only instruction in the fundamental principles, but should arrange to utilize their facilities for research work. The author regarded a good course in photometry as an essential feature, and submitted an outline of eight groups of experiments in this line that are to be given at Cornell University this year. Thirty three-hour weekly periods will be devoted to this work.

President Gartley spoke of the great value of college courses in promoting the cause, and Mr. Elliott stated that it was to be hoped that architects would have the benefit of them, as like the story about the Scotchmen, if they could be caught young enough they could be taught about anything.

Prof. S. W. Ashe spoke in favor of having the regular courses in physics, which generally covered the basis of illuminating engineering, supplemented by lectures by practical men engaged in the work.

Mr. Bond suggested that recommendations as to the character and scope of the work be made by the society, as Mr. Richtmyer had requested.

TUESDAY MORNING SESSION.

The weather was kinder to the convention gathering on Tuesday than on the previous day, and the morning session opened with many new faces.

The first paper, describing "The Photometrical Laboratory of the United Gas Improvement Company," was presented by Charles O. Bond, and this was immediately followed by Dr. E. P. Hyde's paper on "The Physical Laboratory of the National Electric Lamp Association."

Mr. Bond's paper described the excellent and extensive equipment in the former laboratory, located very near to Philadelphia, which is provided with every facility for conducting photometric and life tests of all kinds of gas-lighting appliances both for indoor and outdoor use. Various kinds of gas, and at any desired pressure, are available. A storage battery and an accurate set of electrical instruments is provided for use in connection with electric incandescent lamps that are used as secondary standards.

Dr. Hyde in his paper described the or-

ganization and objects of the Lamp Association's laboratory in Cleveland, rather than its equipment. It is planned to make it a laboratory for scientific research of the physical, physiological, and even psychological principles underlying the production and utilization of light. The laboratory will not concern itself with ordinary commercial problems. The first class of problems to be investigated will be those concerning the laws of radiation and of the radiating properties of matter. The second will embrace most of the scientific problems peculiar to illuminating engineering. The third will relate to the physiological effects of light and attendant radiations on the eye and other organisms. Connected with the laboratory are a good library and a well-equipped instrument shop. Associated with Dr. Hyde, who is director, are Drs. H. E. Ives, P. W. Cobb and F. E. Cady.

Dr. C. H. Sharp, who opened the discussion, called attention to the growing tendency among men of financial affairs to give greater consideration to matters which were far removed from any apparent direct benefits. The fact that such an elaborate and complete laboratory had been installed by a gas company marked a new era, as in former years the tendency had been toward the chemical rather than the photometrical side of the business.

W. H. Gartley stated that a few years ago the possession of a photometer gave a man a standing, but the trouble began when he had two and tried to make his results balance (laughter). The papers were also discussed by Messrs. Millar and Litle.

A paper entitled "Notes on Chemical Luminescence of Rare Earths" was read by Dr. A. Simonini. This was followed by one on "The Light of the Fire-fly," by Drs. H. E. Ives and W. W. Coblentz, this paper being read by the former.

The former paper narrated the results of a series of experiments conducted by its author while at work in the laboratory of Dr. Carl Auer von Welsbach in 1894-5. These confirmed the author's theory that the high incandescence of the Welsbach mantle is due to a recurrent oxidation and reduction of that constituent oxide which has several stages of oxidation. This is compared to the action in a mercury-vapor arc, the effects of the anode and oxidizing flame and also of the cathode and reducing flame being of a similar order.

The paper by Drs. Ives and Coblentz gave the results of their study of the characteristics of the fire-fly light. Its spectrum was photographed and, by comparison with that of a carbon glow lamp, its spectrophotometric curve and the distribution of its radiant energy determined. The light was found to consist of an unsymmetrical structureless band in the yellow-green of the spectrum. Its luminous efficiency was calculated as 96.5 per cent as compared with 0.4 per cent for the carbon glow lamp used and about four per cent for the most efficient artificial illuminant, the mercury arc. This value is obtained on the assumption that there is no infra-red radiation other than "animal heat." The light of the fire-fly would not be acceptable as an illuminant for general purposes because of its green hue and small spectral extent. The color values of objects illuminated by it would be distorted to a greater extent than by the mercury arc. The most efficient light for human use would be a light similar to the fire-fly light in containing no radiation beyond the visible spectrum, but differing from it by being white. Such a light would have a luminous efficiency of about forty-five per cent or about twenty-two candles per watt. Where color is of secondary importance it is not unreasonable to hope that we may some time approach the fire-fly efficiency.

Dr. Sharp, in discussing these two papers, referred to the fact that Dr. E. L. Nichols stated nearly twenty years ago that the efficiency of the gas mantle was due to phosphorescence or luminescence and not to temperature only. He regarded the results brought out by Drs. Ives and Coblentz as of the greatest significance in pointing out to us the possibility of great improvement in the methods of light production.

Dr. Louis Bell said he hoped that bolometer measurements would be taken by Dr. Ives in future experiments along this line as those taken by Professor Langley had received so much criticism. These investigations might be extended with profit to the study of many chemical charges that are accompanied by radiations of limited extent similar to those of the fire-fly.

As it was long past the hour for adjournment and a photographer was in attendance the discussion was interrupted at this point and the meeting adjourned to look happy.

TUESDAY EVENING SESSION.

At the evening session the society was fortunate in having among the members present Walton Clark, who is the president of the Franklin Institute, of Philadelphia, and past-president of the American Gas Institute. He addressed the meeting briefly, congratulating the illuminating engineers on their efforts to conserve our natural resources and our eyesight as well.

The only topic on the programme for the evening was the lecture that was delivered by Dr. Chas. P. Steinmetz on "The Physiological Effects of Radiation."

The speaker dwelt especially on the effects of radiation outside of the visible spectrum. He stated that in spite of the fact that daylight contained far more of the ultra-violet rays than artificial illuminants, nevertheless the latter were much more harmful, so that we must look for something besides ultra-violet light as the cause of the trouble. The troubles which our eyes are subject to he divided into three classes: Indirect, due to impairment of color distinction; direct, due to the power or quantity of radiation, and specific, due to high frequencies. Regarding the trouble due to the second phase of the question, the lecturer explained that the harm from a four-watt-per-candle lamp was greater than from a two-watt-per-candle lamp on account of the greater energy or power outside of the visible spectrum which reaches the eye.

At the conclusion of Dr. Steinmetz' lecture, the subject was discussed by Messrs. Jones, Bond and Klumpp and Drs. Cobb, Simonini, Hyde, Bell and Elliott.

WEDNESDAY MORNING SESSION.

There were no distractions in the way of parades on Wednesday, and with beautiful weather the attendance was noticeably better.

The first paper, "Allowable Amplitudes and Frequencies of Voltage Fluctuations in Incandescent Lamps," was presented by Dr. Herbert E. Ives.

This paper gave the results of an investigation to determine the frequency at which flicker due to various voltage fluctuations just vanishes in carbon and tungsten incandescent lamps. The tests were made at the Bureau of Standards and the flicker was produced by superposing an alternating electromotive force upon a direct electromotive force, or the reverse. The frequency of the former was varied from four to seventy-five cycles per second. The results were shown graphically and indicated that for slight fluctuations of voltage an excessively rapid rise of the frequency is necessary. A three per cent change in voltage with a carbon lamp means under normal conditions an eighteen per cent change in light, while with a tungsten lamp about twelve per cent change in light.

In the discussion Mr. Fisher pointed out that low frequency, such as twenty-five cycles, was permissible in street lighting where the intensity of illumination was low.

Dr. Sharp said that the sensation of flicker was stronger when we looked at an illuminated object than when we looked at the lamp. Others entering into the discussion were Messrs. Menill, Hyde and Perkins.

The next paper, by Dr. Louis Bell, was entitled "The Principles of Shades and Reflectors."

The author defined a shade as a structure which is intended chiefly to keep the direct light of the illuminant out of one's eyes, and a reflector as a structure intended chiefly to redistribute the radiation into more useful directions than are available with the unmodified source. Some devices are both shade and reflector. By decreasing the intrinsic brilliancy the visual usefulness of the light as actually applied is increased, even though the actual loss of light flux in passing through diffusing globes amounts to from about ten to as much as fifty or sixty per cent, depending on the amount of roughening, sand-blasting, or opalescence of the globe. Dr. Bell then analyzes the action of simple reflectors in re-directing the light, considering a plate directly above the light, a cone and a hemisphere. In regard to prismatic reflectors he calls attention to the fact that the tendency to etch the exterior surface of the reflector results in giving it a diffusing surface. As the etching is increased it reduces the efficacy of the prisms in refracting the light, and if very

dense renders the device into a mere diffuser, just as if there were no prisms.

In the discussion on this paper V. R. Lansingh said that the distribution of light could only be changed materially when either mirror or prismatic glass was used.

Mr. Jones described a metal trough reflector with glass shields for the lamp which gave practically uniform illumination. The paper was also discussed by Messrs. Wohlauer and Owens.

The concluding paper of the morning session was entitled "Standard Relations of Light Distribution," by A. J. Sweet.

In this paper Mr. Sweet advocates the need of standardization of lighting units so as to adapt them to meet the requirements of the bulk of illumination problems, which he classifies into three general groups: (1) Illumination of a room from one light center located in the center of the room, such as most residence rooms and small offices; (2) illumination of large interiors on the basis of the square, such as stores and large offices; (3) illumination of long, narrow rooms by several light centers in a row along the center, such as small stores. Mr. Sweet discussed each of these problems and determined a set of typical distribution curves and constants for each group. In concluding, he asked that the work of standardization be extended as far as possible, even if his analysis should not be approved, in order that the common problems be properly solved by the laymen.

Mr. Woodwell stated that we should encourage the specialist to take up each separate problem by itself rather than use general rules as suggested by the author.

Mr. Hopton thought that the curves shown would give normal valves which would be too high for residence lighting, and H. T. Owens said that the reverse was the case with commercial lighting.

E. L. Elliott congratulated the author for bringing forward suggestions for standardization which the art was badly in need of.

WEDNESDAY AFTERNOON SESSION.

The final session opened with a paper on "The Problem of Heterochromatic Photometry," by P. S. Millar.

The photometry of an illuminant differing in color from the standard used presents great difficulties even on the part of expert observers. In commercial practice very serious discrepancies are encountered. These difficulties and discrepancies are discussed in detail with the aid of actual results of various comparisons. Mr. Millar advocates the transfer of the candlepower unit from the present color to that of, say, the tungsten lamp, which he regards as presenting no insurmountable difficulties. He recommended that the attention of the society's council or of a special committee be called to the consideration of standardization of methods in this branch of photometry.

Dr. C. P. Steinmetz, in discussing the paper, said that the matter of measuring lights of decided color could be done by three operations, as follows: By using the bolometer to determine the radiation, a photographic plate for the actinic rays, and a flicker photometer for the effects of after image. He recommended the use of an illuminometer with a reading card with black letters on white background for low intensities and white letters on a gray background for high intensities.

Dr. Louis Bell stated that with the last-named instrument the trouble would be that the result would be one of adaption rather than perception, which was agreed to by Prof. S. W. Ashe.

Mr. Sweet described a tungsten lamp which was constructed to meet with the necessary requirements of a standard.

The next matter taken up was the conclusion of the discussion on the papers of Drs. Ives and Simonini, which had been interrupted the day before.

Dr. Steinmetz was of the opinion that the spectrum of a single fire-fly would show an even narrower area than that from the large number used by Dr. Ives. He then discussed the earliest as well as the largest application of selective radiation, the Welsbach mantle showing that the greenish color was characteristic of this phenomena. Dr. Ives did not agree with Dr. Steinmetz regarding the spectrum.

The paper by Mr. Norman Macbeth on "Some Results Obtained Through Illuminometry" was then read but not discussed.

This paper gave the results of a series of illuminometer tests of incandescent gas lamps equipped with different reflectors and mounted at various distances above the test plane in a room having alternately light and dark walls. Considerable variation was found in the results actually observed at heights of four, six and eight feet from the calculated values. This was attributed to the effect of the reflectors.

L. B. Marks then read his paper on "Factory Lighting."

The author made a study of the actual lighting conditions, both by day and night, in five factories devoted to the manufacture of typewriters and kindred appliances. These factories were lighted almost entirely by individual localized incandescent lamps. The results are given in detail and their shortcomings carefully pointed out. The illumination produced was found to be confined to small very bright zones with an excessive amount of harmful reflection from the smooth surfaces of the machines; the frequent handling of the lamps by the operators to adjust their height resulted in soiling them and their reflectors, besides consuming much time; low general illumination is produced which gives a dingy effect to the whole shop; advantage is not taken of the walls and ceilings for their reflecting value. In many cases the artificial local illumination was ten to twenty times the natural illumination by day. All these features show the need for suitable general illumination, proper location of lamps, reduction of intrinsic brightness, improved diffusion, etc.

A short discussion followed by Messrs. Millar, Forest, Rowe and Macbeth.

The paper on "Operating Efficiencies of Some Commercial Installations of Lighting Systems," by A. L. Eustice, was then presented.

Mr. Eustice's paper gave the results of an extended investigation of actual illuminating efficiencies attained in twenty-one different commercial installations in which a total of sixty-six sets of tests were made by him. These tests were made with the lighting units both as actually found, i. e., more or less dirty, and after cleaning them. A series of laboratory tests was also conducted. The conclusions from the various results make it evident that the conditions under which lighting systems, employed the same type of unit, are installed, are so varied that it is almost impossible to lay down or establish definite illumination efficiency factors to be used promiscuously by one lacking a great amount of experience. In all cases it is necessary to increase any theoretical factors obtained in order to provide additional voltage to take care of depreciation, not only of the candlepower of the units, but also due to accumulation of dirt. The latter varies with different systems, since a unit that does not depend primarily upon reflecting glassware suffers least in application to commercial systems.

V. R. Lansingh said that the figures which he had given out some time ago were based upon the data available at that time and that they would have to be revised. A short discussion followed by Messrs. Macbeth and Jones.

The paper on "Tests of Moore Tube Lighting Installation, New York Post Office," by Dr. E. P. Hyde and J. E. Woodwell, was read by title only, as the authors were unable to be present. It reported the results of a number of tests made in June, 1908.

The final paper on "Tests of a Moore Tube," by Dr. C. H. Sharp and P. S. Millar, was read by the latter.

These tests were made in Assembly Room No. 2 of the Engineering Societies Building in New York city in July, 1907. The tube was 176 feet long and was operated at sixty cycles. It was found to give a mean horizontal candlepower of 8.1 per one-foot section, and to have an efficiency of 2.39 watts per mean horizontal candlepower. The total watt consumption was 3451 at 220.3 volts.

In the discussion, Dr. Ives gave some figures of a recent test as to the color value in connection with the paper he presented at the last annual convention.

Mr. Warner stated that he had made some tests for efficiency which were fifty per cent better than those given in the paper.

The convention then adjourned. The total registration was 244 members and 185 guests.

ENTERTAINMENT FEATURES.

There was no end to the entertainments that afforded relaxation to the members

and their guests. In fact, the number of attractions of the Hudson-Fulton Celebration were so numerous that they became almost distractions to the convention. Great interest was taken in the grand illumination on all sides.

The reception committee wisely left Monday evening for less strenuous things and the members, accompanied by a host of ladies, enjoyed a delightful musicale which was followed by an informal reception, with many tempting viands to appease the inner man.

Tuesday afternoon was devoted entirely to a review of the great historical parade. After the session on Tuesday evening closed, the members journeyed in automobiles to Riverside Drive to view the Ryan scintillator, and from there down through the city and over to Brooklyn. This was a most successful feature of the convention because New York was illuminated as never before.

On the following morning some 150 guests, of the fair sex, embarked in touring cars on a long trip not only in New York but through Westchester County as well.

THE EXHIBIT.

In connection with the convention a most interesting exhibit of lighting appliances was held in a building a few doors from the convention hall. It was notable for the elaborate displays of the individual exhibits rather than the number of exhibitors.

The Leeds-Northrup Company, of Philadelphia, exhibited a number of photometric and electrical instruments.

The Electrical Testing Laboratories, New York city, had a booth with the following photometric screens in use so that they could be compared: Lummer-Brodhun contrast, Lummer-Brodhun comparison, Martens bi-prism, Bunsen and flicker.

Foote-Bierson & Company showed the Sharp-Millar photometers and a number of electrical measuring instruments.

The Welsbach Company had as fine a display of gas fixtures, and their tasteful arrangement gave an air of comfort quite unusual in such exhibits.

The Holophane Company showed an ever-increasing line of glassware for both gas and electric lamps and the inevitable comparison booth. A full line of the Holophane-D'Olier reflectors were also shown.

The General Electric Company had a generous display of arc and incandescent lamps, particularly tungsten.

The new Westinghouse-Nernst lamps, with their attractive fixtures, were shown by the Nernst Lamp Company.

Various types of Cooper-Hewitt tubes were exhibited by the company of that name.

The Westinghouse Electric and Manufacturing Company showed a complete line of tungsten lamps with both opal and Holophane reflectors.

A number of historical and educational features were also exhibited.

The Illuminating Engineering Society of Great Britain.

As is well known there has recently been organized in London an association of illuminating engineers called, like its American sister-society, The Illuminating Engineering Society. This society received its greatest impetus at an inaugural dinner given in London on February 9 last, and all who attended on this occasion became charter members. On May 25 a meeting was held at which the constitution that had been drafted was formally adopted.

The first of the technical sessions will be held in November, the exact date to be announced very soon. At the council meeting, held on June 18, it was decided that dues paid by those who join the society during the present year should cover the period up to December 31, 1910. The honorary secretary is Leon Gaster, editor of *The Illuminating Engineer,* of London, who has been most instrumental in the movement that resulted in the society's formation and who is actively soliciting scientists, engineers and architects interested in the study of the science and art of illumination to aid in this work by joining the new society. Mr. Gaster's address is 32 Victoria Street, London, S. W. He will be pleased to communicate with anyone interested in the objects of the society.

It is now understood that Prof. S. P. Thompson has kindly consented to become the first president of the society, and that influential support has been received from many distinguished authorities on matters of illumination in Great Britain, on the Continent, and in America.

In order to illustrate the representative and international nature of this support, there are given below, in alphabetical order, the names of a few of those who are expressing their sympathy with the movement by becoming vice-presidents and corresponding members:

Dr. Louis Bell, Boston, Mass.; Dr. L. Bloch, Berlin; Prof. A. Blondel, Paris; Dr. E. Budde, Berlin; Prof. H. Bunte, Karlsruhe; Sir William Crookes, London; M. Sainte Claire Deville, Paris; Prof. H. Drehschmidt, Berlin; E. L. Elliott, New York; Dr. A. H. Elliott, New York; Prof. J. A. Fleming, London; Dr. E. P. Hyde, Cleveland, Ohio; Dr. H. Kruss, Hamburg; V. R. Lansingh, New York; Prof. Vivian Lewes, London; Sir William Preece, London; Sir Boverton Redwood, London; Prof. S. Rumi, Genoa; Dr. E. Schilling, Munich; Prof. H. Strache, Vienna; Prof. K. Ulbricht, Dresden; Dr. W. Voege, Hamburg; Sir H. Trueman Wood, London.

In addition, a very representative council has now been formed. The society will therefore enter upon its opening session, next November, under excellent auspices, and has every reason to hope for a long and prosperous existence.

Chicago Publisher Seeks Lighting Franchise in Ottawa, Ill.

W. D. Boyce, of Chicago and Marseilles, Ill., and publisher of various Chicago weeklies, has two petitions, an ordinance and a communication from his legal representative before the City Council of Ottawa, Ill. He has been building a high-power transmission line along the banks of the canal from Marseilles to La Salle. The Ottawa authorities refused to let him cross the city without action by the City Council.

He asked permission to do so. This line has nothing to do with the regular franchise that he asked for. It was claimed that by permitting him to complete this line the county could buy light and power for the county farm much cheaper than had yet been offered them.

This petition was quietly received and filed.

Then came his petition for a franchise to distribute light, heat and power, by electric current, through the City of Ottawa. His petition set forth that he had secured frontage consents from a majority of the property along each proposed street to be occupied. The franchise is asked for fifty years, the matter of compensation not being stated very clearly in the petition.

Alderman Dinneen wisely suggested that the ordinance be published, that the people may see just what is asked for. The whole matter was referred to the judiciary committee and the city attorney.

Mr. Boyce left a few weeks ago for his game hunting by balloon expedition in Africa, which is attracting so much attention.

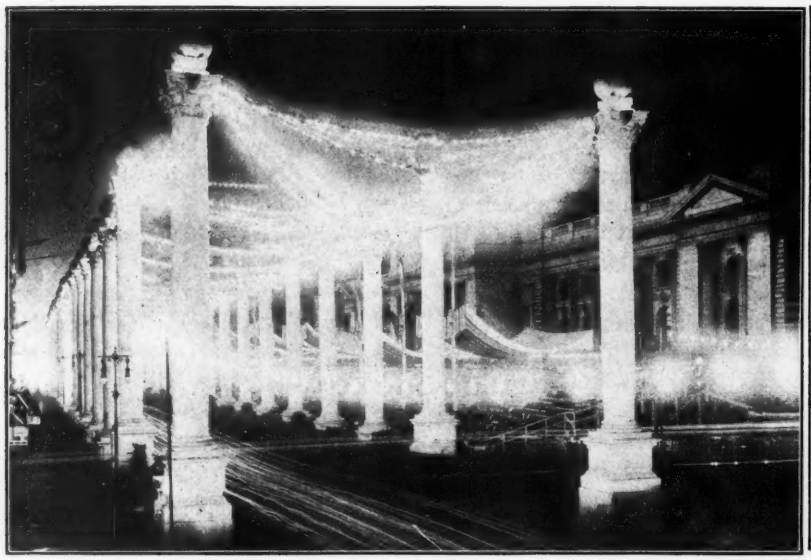
The Hudson-Fulton Celebration.

The Hudson-Fulton Celebration of 1909 has by this date nearly passed into history. It will be remembered as one of the most magnificent festivals ever held in this country. The metropolis and its sister cities along the noble Hudson certainly did their utmost to do honor to the memory of the two famous pioneers of that great river. Both on land and on water were held series of pageants whose participants were gathered from far and near. The civic display rivaled the naval display. As a climax to the events of each day there was an illumination on a scale never before witnessed. A suggestion of what this illumination was like was given in these columns last week with the aid of five views. In this article an attempt will be made to give a little better idea of these displays.

To view all these attractions there were the biggest crowds of people that New York city, much as it is used to handling crowds, ever had assembled. Every means of transit was taxed to more than its normal capacity. By the spreading out of the peak over the larger part of the day, and particularly in the evening, all traffic records were broken right on the first day of the celebration. The elevated and subway lines of the Interborough system carried a total of about fifteen million passengers during the eight days of the celebration in New York city. This massing of humanity was one of the striking features of this extraordinary week.

However, without question, the most successful feature of the Hudson-Fulton Celebration, in fact, the one which will make the most lasting impression, was the special illumination of the buildings, both public and private, the streets, bridges, wharves, vessels and other conspicuous objects, both on land and on water.

There were three land parades, more or less interesting. The last one, held on Saturday night, October 2, was heralded as an illuminated carnival parade,



NEW YORK EDISON PHOTO.

THE COURT OF HONOR ADJOINING THE PUBLIC LIBRARY ON FIFTH AVENUE, NEW YORK.

NEW YORK EDISON PHOTO.

UNION LEAGUE CLUB, NEAR COURT OF HONOR.

NEW YORK EDISON PHOTO.

THE HOTEL PLAZA.

NEW YORK EDISON PHOTO.

GORHAM BUILDING.

but was entirely lacking in the features which go to make such a parade successful. Thousands of men in nightshirts, holding Roman candles, and a hundred highly decorated floats, appealed to the young and the uninitiated, but the effect was dismal and crude as compared with the avenues of light through which the parade passed.

its massive columns and streamers of lights is clearly brought out. Over 7,000 lamps were used here.

The Union League Club, just south of this point, had one of the most effective displays of decorative lighting in the city. The many other clubs were also decorated and outlined.

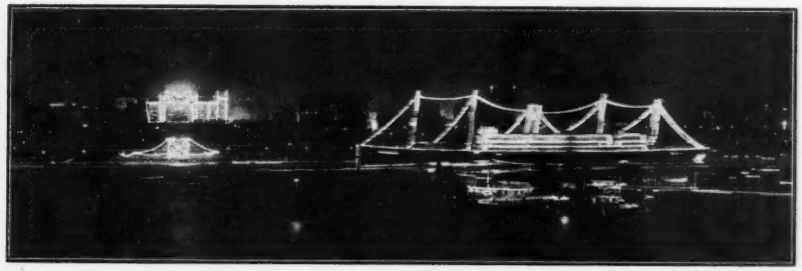
The Plaza Hotel, at Fifty-ninth Street, was illuminated in a manner in keeping with its location, reputation and size. The other famous hostelries vied in their efforts at tasteful display. Another of the striking Fifth Avenue installations was that of the Gorham Building.

The double lane of incandescent lights shown in these views extended the whole length of the parade route, a distance of over five miles. About 30,000 lamps, spaced two feet apart, were used for this purpose.

The illumination of buildings was not confined to the route of the parades, as will be seen from the accompanying illustrations. The lighting of a dry-goods store on One-hundred-and-twenty-fifth Street attracted considerable attention. The New York City Hall and the Home Life Insurance Building are shown below on this page. The Waterside Station of the New York Edison Company was outlined in a very pleasing manner. One view of this installation is shown herewith; another was shown on page 647 of last week's issue.

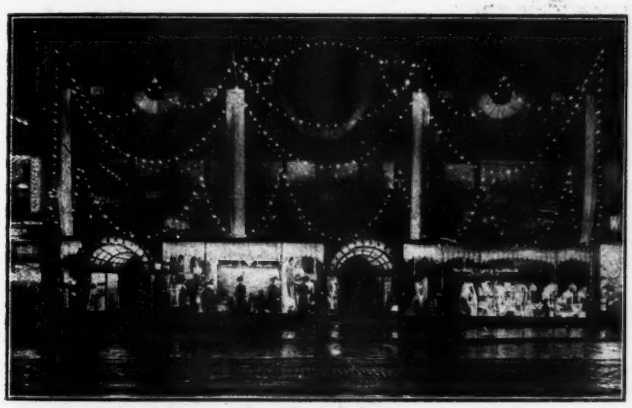
NEW YORK EDISON PHOTO.

BOROUGH HALL, STATEN ISLAND.



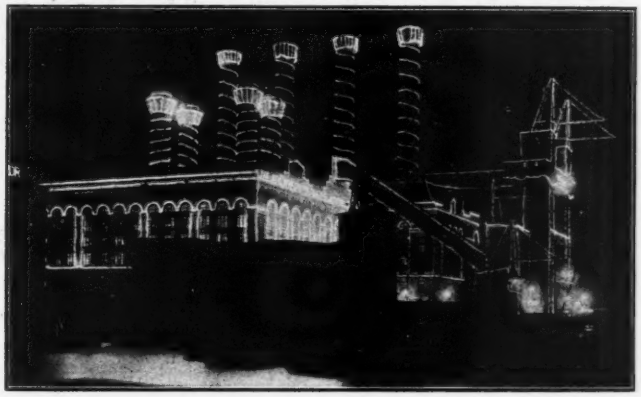
NEW YORK EDISON PHOTO.

WATER GATE AND STEAMER NEW AMSTERDAM.



NEW YORK EDISON PHOTO.

DRY GOODS STORE ON 125TH STREET, NEW YORK.



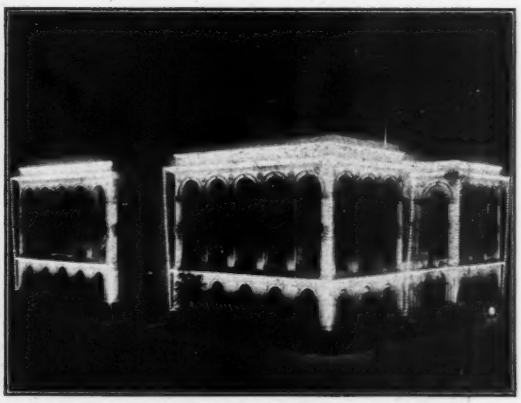
NEW YORK EDISON PHOTO.

WATERSIDE STATION, NEW YORK EDISON COMPANY.

The Court of Honor, adjoining the Public Library, on Fifth Avenue, between Fortieth and Forty-second streets, is shown opposite. It was the center of all the land pageants and it was here that the Vice-President of the United States, the Governor of the State of New York and many other notables reviewed the processions. The general arrangement of

NEW YORK EDISON PHOTO.

CITY HALL, NEW YORK CITY.

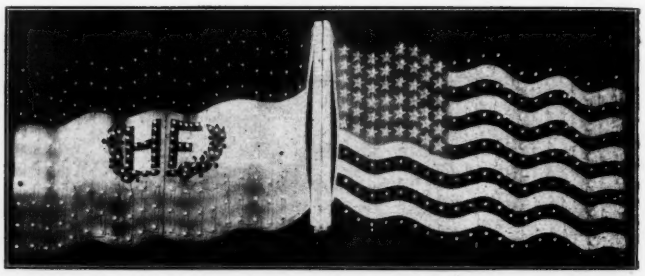


NEW YORK EDISON PHOTO.

BOROUGH HALL, BRONX.

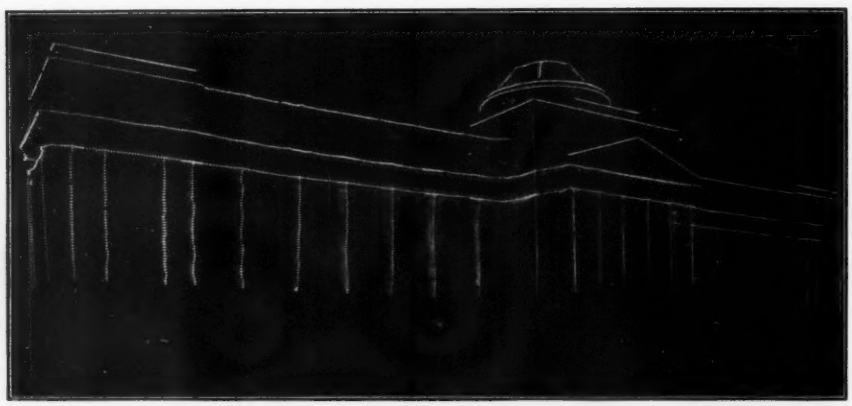
Among the electric lighting displays made by the large number of naval vessels, commercial steamers, yachts, ferries, tugs and other watercraft, one of the most pleasing was that of the great Holland steamship *New Amsterdam*. The accompanying view gives but a very meager idea of the splendor of this effect.

CUPOLA OF BROOKLYN INSTITUTE OF ARTS AND SCIENCES, WATER TOWER, SOLDIERS' AND SAILORS' ARCH.

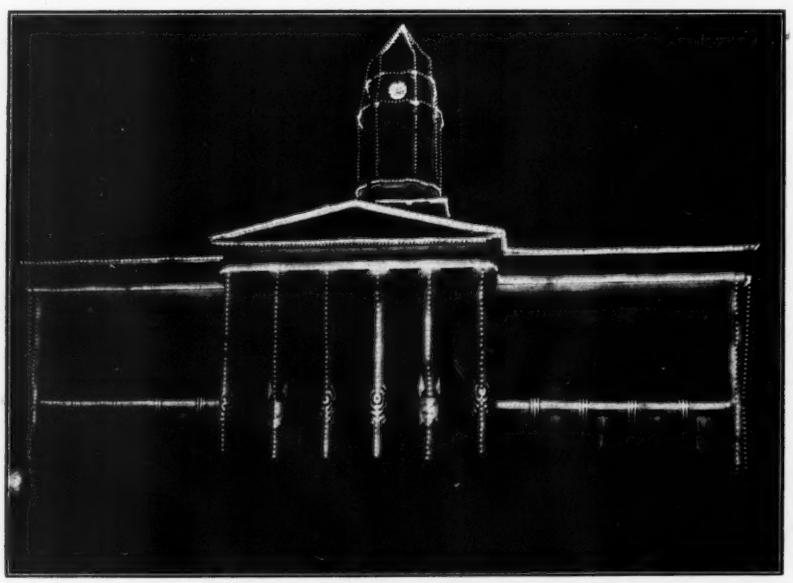


ILLUMINATED FLAGS AT BAY RIDGE, NEAR 87TH STREET, BROOKLYN.

The Brooklyn Institute of Arts and Sciences is one of the architectural monuments of the city and stands upon a good elevation near Prospect Park. This building can be seen from many high points in Manhattan as well as from Williamsburg Bridge. Its outline lighting was admirably done, as will be seen from an accompanying view. Close by is the Soldiers' and Sailors' Monument,



BROOKLYN INSTITUTE OF ARTS AND SCIENCES, EASTERN PARKWAY.

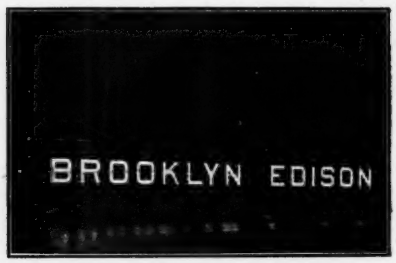


BOROUGH HALL, BROOKLYN.

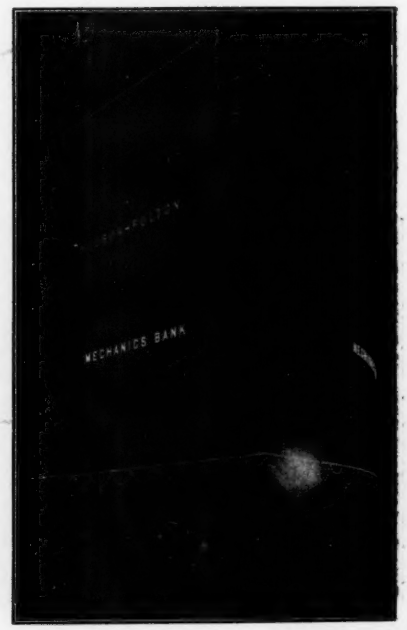
The special illumination for the Hudson-Fulton Celebration was not confined to Manhattan and the Hudson River. Each of the boroughs of the greater city strove to do its share in making the occasion a memorable one. Each of the borough halls was outlined with strings of lamps.

Among the private buildings which were effectively illuminated were the Mechanics' Bank and Dime Savings Bank.

One of the many signs erected on the shore front was the flashing flags erected by the New York Electric Carriage Call Company. It is shown on the adjoining page. The Edison Electric Illuminating Company, of Brooklyn, also had a very



SIGN ALONG WATER FRONT.



MECHANICS BANK, BROOKLYN.

conspicuous though simple sign. As shown, it consisted of the words, "Brooklyn Edison" in bold, twelve-foot letters.

Probably no single feature of the celebration has elicited more attention than

the Ryan scintillator, especially among those interested in illuminating engineering. The scintillator was installed at a prominent point on the extension of Riverside Drive at 155th Street, and its effects could be seen to advantage in every detail from a distance of nearly two miles, so that great crowds have been entertained nightly. The accompanying illustration, showing the auroral effect, was taken about half a mile away.

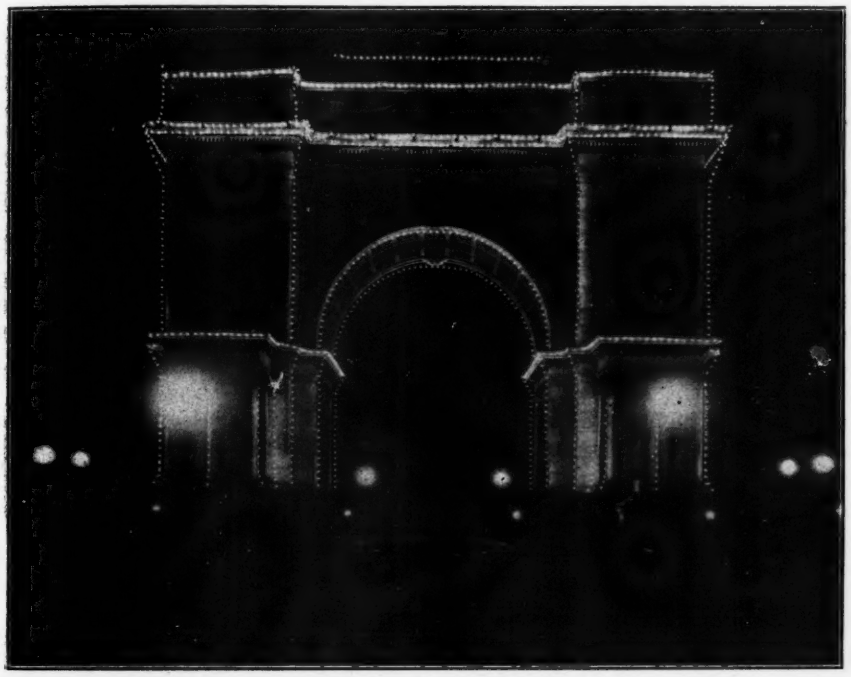
The installation consists of two groups of arc projectors with auxiliary apparatus in the shape of color screens, steam nozzles and devices for throwing bombs into the air. Steam for these nozzles was supplied by a 200-horsepower boiler. As it escaped from the nozzles it formed immense screens of mist, upon which the most exquisite colored and spectacular effects were thrown by the beams from the searchlights.

The searchlights consisted of two batteries, as shown from the rear, each including nine thirty-inch and one twenty-four-inch projectors, the whole set using up to 1,500 amperes when all are in operation. Each searchlight is equipped with six gelatine color slides, and there are six additional hand slides for each projector.

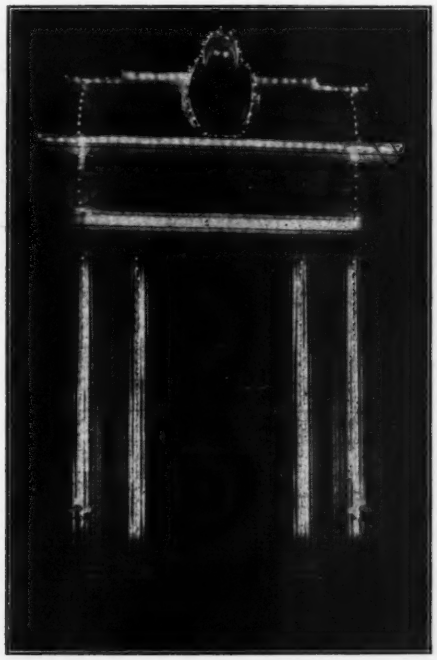
A complete programme of spectacular effects, requiring nearly an hour-and-a-half, was carried out several times each evening. It included sunbursts, auroras, peacock feathers, beam dances, plumes, fans, etc. In addition to the steam effects, bombs were exploded and the varied colors of the searchlights played upon the smoke.

The installation of the scintillator is largely due to the efforts of the New York Edison Company and to C. F. Lacombe, chief engineer of light and power for the city of New York. It is the same equipment as was designed for use at Niagara Falls and was built by the General Electric Company in accordance with the designs of W. D'A. Ryan.

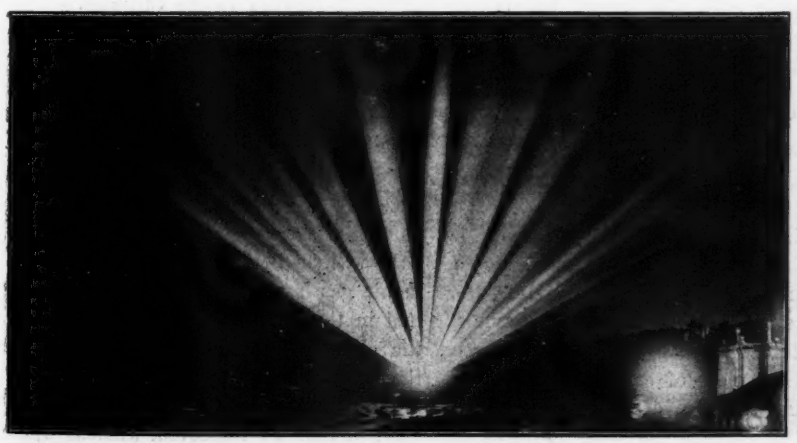
For the photographs from which all the accompanying illustrations were made we are indebted to the New York Edison Company and to the Edison Electric Illuminating Company, of Brooklyn, who supplied the current for practically all the illumination throughout New York city.



SOLDIERS' AND SAILORS' ARCH, PROSPECT PARK PLAZA, BROOKLYN.

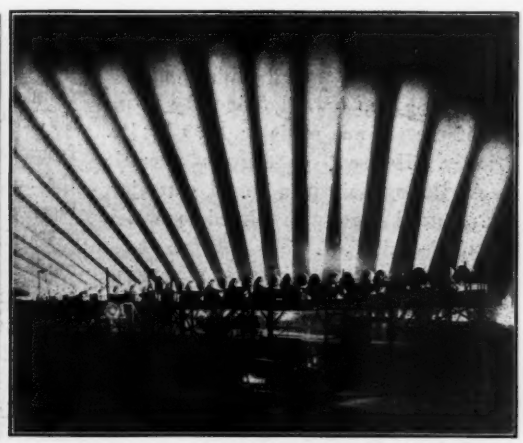


DIME SAVINGS BANK, BROOKLYN.



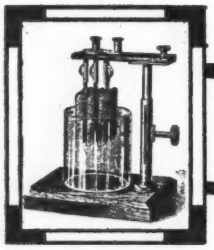
NEW YORK EDISON PHOTO.

THE RYAN SCINTILLATOR, FROM 145TH STREET AND RIVERSIDE DRIVE.



NEW YORK EDISON PHOTO.

RYAN SCINTILLATOR, FROM REAR.



ELECTRO-CHEMISTRY and METALLURGY

Electricity and Fertilizers.[1]

The world is more indebted to the electrical engineers and chemists who have produced the manures calcium nitrate and calcium cyanamide than it at present has any idea of. For if these artificial manures had not come in the nick of time, there is no doubt that the prices of sodium nitrate from Chili and sulphate of ammonia from gas works would have gone soaring up. As it is, the prices have increased some thirty per cent within the last few years.

And the reasons are not far to seek. First, the virgin soils of the world are being rapidly used up; there was a time, not long ago, when wheat could be grown nearly all over the United States without putting in manure, but it is not so now. The natural stores of nitrogen accumulated through the ages have been taken out by repeated cropping of wheat. The second reason is that more and more people in the world are becoming, like ourselves, wheat and meat eaters.

This provision of nitrogen for the gluten in wheat and the fibrine in meat to build up the muscle and tissue of the human body was rapidly becoming the problem of this century, as Sir William Crookes pointed out in 1898, when, without any fuss, some electrical engineers and chemists, called Birkeland and Eyde, Frank and Caro, came forward with solutions.

The first step toward fixing the nitrogen of the air was made in 1773 by Dr. Priestly. He sent a series of electric sparks through air in a closed glass jar, and obtained a brownish colored gas which was nitric oxide.

The principle of the process of making calcium nitrate at Notodden is based on Dr. Priestly's experiments, the sparks he used being replaced by a disk-shaped flaming arc about five feet in diameter. Six years ago Professor Birkeland and S. Eyde built their first furnace of twenty-five horsepower. Two years later they had a plant of 2,500 horsepower, and in 1907 the 40,000-horsepower plant at Notodden, Norway, was set to work. The harnessing of the Rjukan Falls of 220,000 horsepower is now in hand, and by 1912 nearly half a million water horsepower will be used in manufacturing calcium nitrate and nitrite. The Birkeland and Eyde furnace is about eight feet in diameter and three feet through, set on edge like a wheel. It is lined with refractory bricks, and has a disk-shaped arc chamber about five feet diameter by three inches. Alternating current at 5,000 volts is fed across the two water-cooled copper electrodes, and a flaming arc is continually being struck and blown out to the limits of the arc chamber by the repulsion of a powerful electromagnet. Air is forced through the arc chamber under pressure, and is immediately burnt into nitric oxide, and this gas is then led away to two sets of five towers, taking up another atom of oxygen on the way to form nitric peroxide. The first four towers are filled with pieces of quartz over which water and the nitric acid already formed, trickle. The fifth tower is filled with ordinary bricks, with milky lime flowing over them. This quickly absorbs what nitrous gases remain, and is converted into calcium nitrate and nitrite. The first tower yields a fifty per cent nitric acid, the second twenty-five per cent, the third fifteen per cent, and the fourth five per cent. The liquids from the fourth are raised by compressed air to the top of the third, and those from the third to the second, and so on, the acid thus traveling in a counter direction to the gas.

Calcium cyanamide, or "nitroline," is made from carbide of calcium, and the inventors, Professor Frank and Mr. Caro, took the idea from Bunsen and Playfair, who obtained cyanides by passing nitrogen over a hot mass of carbon and alkalies. They first tried barium carbide, but since carbide of calcium has been produced in such great quantities for acetylene-gas lighting it has become very cheap. When carbide of calcium is raised to 1,000 degrees centigrade, it fixes nitrogen directly without the aid of alkalies. Further, if the resulting cyanamide is mixed with water under pressure the nitrogen combines with the hydrogen to form ammonia. This naturally suggested the use of the material as a manure, and it has been so successful that there are now about a dozen factories in the various countries of Europe, in the United States, and even in Japan, turning out about 150,000 tons per annum. The nitrogen content is guaranteed at eighteen per cent.

The manufacture for England is in the hands of the Northwestern Cyanamide Company, which has built a works at Odda, on the Hardanger Fiord, in Norway, capable of turning out 12,000 tons per annum. The calcium carbide made by the affiliated concern, the Ally Carbide Company, is delivered in lumps. After being broken up fine in crushers and mills, it is fed by means of special hoppers with 196 electric resistance furnaces, each capable of holding about 670 pounds. The lids are fastened down air-tight, and nitrogen gas is forced through under pressure, the process being completed in about forty-five hours. The nitrogen gas is made by the Lende process, in which air is led through white-hot copper shavings. The copper at that temperature has a great affinity for the oxygen, so it takes it all up, leaving the nitrogen to be blown forward to the furnaces.

The various reactions may be written down thus:

$CaO + C_2 = CO + CaC_2$ carbide of calcium.

$CaC_2 + 2N = C + CaCN_2$ cyanamide.

$CaCN_2 + 3H_2O = CaCo_3 + 2(NH_3)$, ammonia.

It will be noticed that when the ammonia gas is given up the lime is deposited in the soil. This also happens with the other manure, calcium nitrate, and therefore they both have this advantage over sodium nitrate from Chili. Soils short of lime are improved, whereas when sodium enters the soil it tends to make it "sad." It is not known how the nitrogen passes from the ammonia to the gluten in the wheat ear, but there is no doubt that certain bacteria in the soil play an important part.

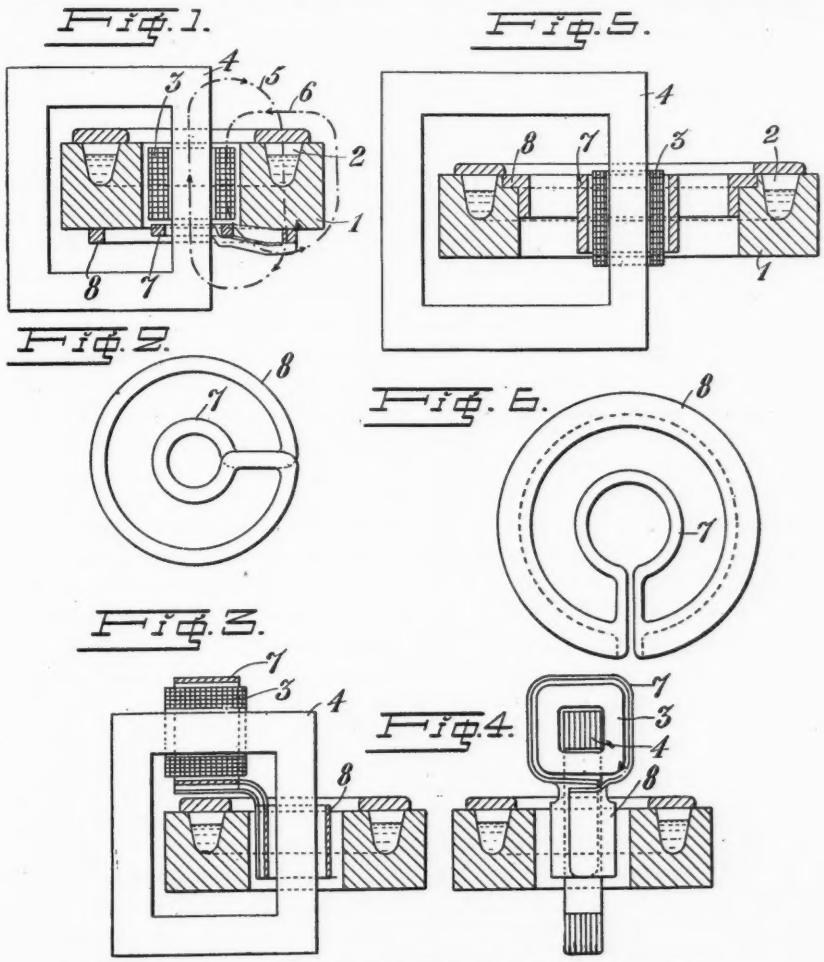
[1] Somewhat condensed from an abstract of a lecture (by F. Kilburn Scott, at the Wye Agricultural College, Wales) in *The Electrical Engineer* (London), September 3.

A New Electric Transformer Furnace.

The electric transformer furnace described herewith is the invention of Otto Frick, of Saltsjöbaden, Sweden (United States Patent No. 933,169, September 7, 1909), assignor to the Gröndal Kjellin Company, Limited, of London, England.

The object of the invention is to suppress, as far as possible, the leakage field, especially that around the primary coil. This is done preferably by placing, around the field core, a short-circuited conductor having two coils placed at a distance from each other and wound in opposite directions, each coil consisting, generally, of only one winding and connected in such a manner as not to be effectively induced by the main field, whereas the lines of force of the leakage field or fields pass through the closed circuit of the conductor and excite therein a current counteracting the said field. Such short-circuited conductors may suitably be termed leakage-field coils.

In the accompanying drawing some forms of embodiment of the invention are schematically illustrated.



DETAILS OF VARIOUS FORMS OF THE FRICK INDUCTION FURNACE.

Fig. 1 shows a vertical section through one form of the invention. Fig. 2 shows a plan of the short-circuit conductor employed therein. Figs. 3 and 4 show two sections, at right angles to each other, of a second form of the invention. Fig. 5 shows a vertical section through a third form of the invention. Fig. 6 shows a plan of the short-circuit conductor employed according to Fig. 5.

The furnace shown in Fig. 1 is provided, as usual, with an annular melting space 2, arranged in a suitable brickwork 1, as well as with a primary coil 3, placed around the shank of the closed iron core 4, passing through the central opening in the brickwork. In such an arrangement of the primary and secondary conductors of the furnace, leakage fields are created about the said conductors, the limits of the said leakage fields in the right half-part of the sections shown being represented by the dotted lines 5, 6, respectively. The direction of the flux of the lines of force in a given moment is indicated by the arrows.

In order to neutralize the leakage field from the primary coil, there is placed, beneath the primary coil, a short-circuited conductor or loop consisting of a central part 7, situated immediately below the primary coil 3, and an outer part 8, whose diameter is so large that it substantially encloses the leakage field of the primary coil and which is so arranged that the current in the same will run in opposite direction to that in the part 7. As may be easily understood, the main field in the closed iron core exerts the same inducing action in the parts 7 and 8, of the short-circuit loop or conductor 7, 8, and inasmuch as these parts are connected in series so that the induced currents will flow in opposite directions, the result of this induction will be zero. The leakage field of the primary coil flowing between the parts 7 and 8 excites in the short-circuit conductor a current counteracting the leakage field.

As indicated in the drawing, a part also of the leakage field of the secondary conductor passes through the space between the hoops 7 and 8, formed by the short-circuit conductor, and, inasmuch as this field has the same direction as the primary one, also, this leakage field is partly counteracted by the current produced in the short-circuit conductor. As easily seen, the possibility of counteracting the leakage field of the secondary conductor is to an essential degree dependent upon the possibility of placing the short-circuit conductor in close proximity to the secondary conductor. As the secondary conductor can here be formed by a thick cable or bar without electric insulation, it is easily understood that the said conductor can without danger be heated to a high temperature, so that it can be placed close up to or within the brickwork at an inconsiderable distance from the melting bath. It is also obvious that more than one short-circuit conductor of the kind described may be employed within the leakage fields, if desired. Obviously, the action of the said short-circuit conductors is chiefly dependent upon their cross-sectional area, which determines their capacity of conducting the short-circuit currents necessary for suppressing the leakage fields, without any higher tension being required in the short-circuit conductor.

The invention furnishes an effective means of suppressing, to an essential degree, the injurious consequences of disposing the primary coil outside the part of the iron core enclosed in the secondary conductors, for instance on any of the

horizontal shanks of the iron core, in that by placing one winding of a conductor or loop close around or within the primary coil and connecting this winding with a winding around the central iron core, as shown in Figs. 3 and 4, the leakage fields may be employed for producing in these windings a current tending to blow away the leakage fields. Such an arrangement is schematically shown in Figs. 3 and 4. The primary coil 3 is placed around the upper horizontal shank of the iron core 4. Thus a strong leakage field will be created about the primary coil which, in case no measures were taken to prevent it, would entail unfavorable working conditions for the furnace. According to this invention, a short-circuit conductor in two sections is arranged about the iron core. The current produced therein has no action upon the main field passing through the iron core, the direction of current in one part being opposite to that in the other part in relation to the iron core. The parts of the primary and secondary leakage penetrating the space between 7 and 8 produce a current in the short-circuit conductor, which current tends, in the same manner as in the arrangement shown in Figs. 1 and 2, to counteract or blow off the leakage fields.

Fig. 5 shows a short-circuit conductor acting to suppress the chief parts of the primary as well as of the secondary leakage field. This effect is gained by extending the inner part of the short-circuit conductor along the whole primary coil and placing its outer part as near the melting bath as possible. For the rest, the arrangement is analogous to that illustrated in Figs. 1 and 2 in that the two parts 7 and 8, are connected to each other in such a manner that their windings run in opposite directions. The advantage of this arrangement is especially obvious, when the furnace is built with a melting bath of a great diameter.

In order to obtain the greatest possible effect it is advantageous to divide the primary coil, or the short-circuit conductor, respectively, into parts arranged between one another. In certain cases the leakage-field coil can be built up of solid copper plates. For instance, in Fig. 2, it might consist of a circular disk having at the middle thereof a circular opening for the central iron core and being also cut radially.

Electrolytic Iron.

The electrolytic production of iron direct from iron ores, though possible, has so far not attained practical importance. Electrical refining of iron, on the other hand, is continually extending. Electrolytic iron is unsurpassed in purity. As any kind of commercial iron of low quality may be used for its production, it is possible to convert iron of lower value into high-priced material, that is, provided cheap current is obtainable. At this year's convention of the German Bunsen Society the Langbein-Pfannhauser Works exhibited samples of electrolytic iron manufactured by the process of Prof. Franz Fischer, which possess excellent qualities and are applicable for many purposes. This iron contains at most 0.05 per cent of impurities, and is therefore nearly chemically pure. When heated its hardness falls below that of silver and gold, and it may therefore be easily worked, cold-rolled and forged. By means of hardening agents, that is, by the addition of carbon, it may be hardened entirely, or only in places, if desired. Its magnetic qualities are the highest that have been observed at the Imperial Physico-Technical Institute in Berlin. Plates of 0.01 to ten millimetres in thickness may be readily manufactured. By first depositing nickel and then iron of the desired thickness on a polished cathode, plates coated with nickel on one side and having a perfectly smooth, polished surface may be produced. There would seem to be a special field for electrolytic iron in the manufacture of electrotype plates, as the printing surface may be readily made hard and the strengthening part soft and flexible. Seamless iron tubes may also be manufactured and lead tubes may be armored with a perfectly adhering iron coating. It may be safely assumed that the possibility of manufacturing electrolytically the greatest variety of objects from this kind of iron will open for it fields of application that are presently not thought of.—*Translated and abstracted from Die Umschau (Frankfort-on-the-Main), September 4.*

A New Electric Furnace for Iron Extraction.

For several years three Swedish inventors, Messrs. Stalhane, Sindblad and Groenwall, have devoted themselves to the perfection of an electric furnace for smelting iron ores, which would meet certain conditions laid down by Doctor Haanel in a report to the Canadian Government on experiments made at Sault Ste. Marie in 1906 with the Héroult furnace. Last December Doctor Haanel visited the furnace of the Swedish inventors on behalf of his government, and the following information is given by him regarding this apparatus. In general appearance the furnace closely resembles the ordinary blast furnace. It comprises a conical chimney, surmounting a greatly enlarged fusion chamber, into which carbon electrodes are introduced obliquely and converging toward the center. The only departure from the form of the blast furnace is in the lower part of the reduction zone, immediately over the fusion zone, which contracts at a height of about 1.8 metres, so as to have the shape of an inverted cone. The object of this construction is to direct the fall of the charge so that it cannot come in contact with the lining of the arch in the neighborhood of the electrodes, in order to prevent the rapid destruction of the lining. On account of this arrangement there is always a free space around the electrodes, and in order to make the protection perfect, cooling gas jets are directed against the arch through tubes placed in proximity to the electrodes. The gases employed are taken from the upper part of the furnace and are made to return to the same by an electrically operated blower. This combination solves the problem of utilizing the reducing and heating powers of the electric furnace gases; their circulation furthermore has the advantage of insuring a more uniform distribution of the heat. The insulation of the electrodes also meets the requirements indicated by Haanel. The model visited by him at Domnarfvet is 7.5 metres high, the fusion chamber measuring 2.1, and the reduction zone 5.4 metres. It is operated by three-phase currents and has three electrodes held in water-cooled fixtures protected on the outside against oxidation. Their regulation is effected by hand. The experiments demonstrated that the furnace is capable of meeting all requirements of an apparatus intended for industrial operation. Recently the same inventors have also patented a three-phase refining furnace, in which there are only two carbon electrodes, the third phase being connected with the hearth, which is lined with a mixture of graphite and magnesia. This arrangement of the electrodes gives the fused mass a rotary motion in a vertical direction, and new material is thus continually brought in contact with the slag, which is favorable for the reactions.—*Translated and abstracted from L'Electricien (Paris), August 20.*

The New Electrochemical Developments in South Africa.

In our issue of September 4 last, there was an account (on p. 431) of a "New Electrical Industry for South Africa." Further details of this undertaking have just been received from a London correspondent, who writes as follows:

"It is proposed that in addition to the waterpower station on the Crocodile River a steam-power station should be erected forthwith, situated in the Middleburg District, right in the heart of the coalfields, where exceptional facilities for cheap water and coal supply are available, enabling the company to produce as cheap power for electric bulk supply as in any other steam-generated station anywhere in the world.

"The principal objects for which the company will be formed are the manufacture of nitric acid and nitrate of lime from the atmosphere, the manufacture of calcium carbide and the manufacture of cyanamide. The steam station will have a capacity of about 40,000 kilowatts.

"The production of nitric acid from the atmosphere is especially suited for South Africa, more especially in the interior, as the freights on nitrate of soda, sulphur and other products necessary for this manufacture make the ordinary methods much more expensive.

"Large quantities of nitric acid are being used in the dynamite factories, so that there should be no difficulty in disposing of a considerable quantity of this acid on favorable terms. The South African colonists should also become very good customers, in the near future, of artificial manures, but as the introduction of these manures will require some time for development it is only proposed to start with an output of 5,000 tons of nitrate fertilizers per annum, the quantities being increased from time to time as this particular branch of the company's industries develops.

"As to the manufacture of calcium carbide in the country this part of the business can be made very attractive through the introduction of acetylene lamps in the mines. At present candles are mostly used, and it is estimated that by the introduction of suitable acetylene lamps, which are now most extensively used both in America and Germany, the mines would be able to save at least thirty-three per cent of their present lighting bill.

"Harper Bros. & Co., 13 St. Helen's Place, London, England, who will be consulting engineers to the new company, are at present engaged in working out the details of the scheme, and are also arranging for the finance of the new company, and it is anticipated that the putting up of the plants and the construction of the works will be commenced early in 1910."

A New Kind of Primary Cell.

In a recent number of *La Revue Electrique* appears a description of a primary cell using some of the elements of the Leclanché cell, but having entirely different characteristics. This battery, which has been patented by Aubert Frères, differs from the Leclanché cell in that chloride of manganese has been substituted as electrolyte for the sal-ammoniac solution. Zinc is used as negative electrode, a mixture having manganese dioxide for a basis as positive electrode, and a concentrated solution of chloride of manganese as electrolyte. The advantages claimed for this battery are that its tension drops only slightly during the discharge; that it is not exhausted on open circuit; and that it can be short-circuited without deterioration. Furthermore, the battery is said to have a large ampere-hour capacity and a low internal resistance. These advantages are claimed to be due to the great concentration which it is possible to attain in the chloride of manganese, which may reach 150 per cent in weight. For this reason the liquid will not freeze at the lowest temperatures to which it might be exposed. After exhaustion the battery can be regenerated like an accumulator by a charging current. There is no creeping of salts in the battery, and the fluid remains clear.

Indicating Gas Engines.

In a paper recently presented before a meeting of the (British) Institution of Mechanical Engineers, Prof. F. W. Burstall, of Birmingham (Eng.) University, gave some interesting results on the indicating of gas engines. Two indicators, one of the ordinary type, and the other of the special type (or manograph), were used, the usual cord being replaced by a phosphor-bronze stranded wire. As a result of numerous tests the discrepancy between the diagrams from the two types of indicators was less than three per cent, thus showing that at least a fairly accurate indicator card can be obtained from the gas engine as well as from the steam engine. These results would also seem to indicate the reliability of the best ordinary types of indicators for high-speed engines.

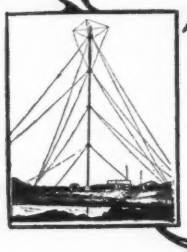
Boston Tunnel Contract Signed.

With the decree of the Massachusetts Supreme Court entered, establishing the right of the Transit Commission to select the route for the Boston end of the Cambridge subway, and its right to make that location under the Boston Common, the Boston Transit Commission will begin work. This is with knowledge of the fact that the petitioners who vainly sought to have the Massachusetts courts save the Common from further tunnel construction still have the right to appeal to the United States Supreme Court, but it is deemed unlikely that that right will be exercised. After the decree had been entered the Transit Commission held a meeting at its office on Beacon street and signed the necessary papers so that the contract may be delivered to Patrick McGovern.

May Discontinue Service for Non-Payment of Bills.

The recent decision by the Wisconsin State Railroad Commission of a question involving a feature of the public-utilities law is looked upon as important to concerns of this class. The case in question was that of Oscar J. Berend, of Milwaukee, against the Wisconsin Telephone Company. It had been the general impression that under the law a public-utility company, in order to enforce a claim for service, would have to go to the courts, and that until this had been done it could not cut off service from any consumer on account of non-payment of bills. While the law does not give the Railroad Commission the power to pass on disputed claims of corporations of this character, it does give it authority to decide as to the reasonableness of rules and regulations of such concerns. It was upon this basis that the case in question was presented to the Railroad Commission by Mr. Behrend after the telephone company had discontinued service and he had been defeated in mandamus proceedings in the courts. The Railroad Commission reviewed the question of the right of the company to demand payment in advance and to require security or deposit to insure payment of bills for past service or payment in advance. The commission held that the rule of the company is reasonable and should be enforced. M.

Over the American telegraph wires in 1907 there were flashed 368,470,509 messages, of which 5,869,317 were cablegrams.



TELEGRAPHY—TELEPHONY, and WIRELESS.

The Bolt Head Wireless Station.

The wireless telegraph station which was opened last December by the British Post Office Service at Bolt Head, near Kingbridge, South Devon, England, is situated about 350 feet above the sea level and was the first station to be used in public service, in England at any rate, for communicating with ships at sea. We are indebted to *Electrical Engineering*, of London, for the following description and illustrations of this interesting station, the information being originally given out through the courtesy of Major W. A. J. O'Meara, engineer-in-chief to the post office.

The generating plant and apparatus for the new station are contained in a one-story brick building, fifteen feet wide by fifty-five feet long. In order to insure the utmost dispatch in starting and also to minimize noise, the three-kilowatt alternating-generator is coupled to a direct-current machine, which is normally run as a motor from a storage battery. To charge the battery the two machines are driven through a clutch by an eight-horsepower horizontal Campbell oil engine, running at 265 revolutions per minute. Current for the wireless apparatus can be taken from the alternator at the same time.

Alternating current is generated at 100 volts, fifty cycles, and is transformed up to from 15,000 to 20,000 volts, according to the length of the spark gap which is being used. The transformer is of the ordinary oil-cooled type, with a capacity of three kilowatts, and the secondary pressure is varied by means of an inductance (*A*, see Fig. 1) in the primary circuit. Besides driving the motor-generator set, the battery is used for lighting the building.

The battery consists of fifty-two cells of the D. P. Accumulator Company's pattern in glass boxes, and has a capacity of 180 ampere-hours on a nine-hour discharge rate. The signaling is done in the generator circuit by means of a Morse manipulating key, *B*, which controls a special form of magnetic key, *C*. This latter key is designed to prevent the circuit from being opened at any time except when the alternating current is passing through its zero value, thus preventing injurious sparking at the contact of the Morse key.

The secondary of the main transformer, *D*, is connected through two iron-core choking coils, *E*, and two air-core choking coils, to the battery of condensers, *F*; and the oscillatory circuit, consisting of the spark gap, *G*, high-frequency tuning inductance, *H*, and the primary coil of the high-frequency oscillation transformer, *K*, is connected across the condenser as shown. The iron-core choking coils, *E*, prevent any high-frequency oscillations from reaching the main transformer, *D*. The spark gap is of the standard Marconi pattern, the one illustrated in Fig. 2 being for one of one-and-one-half-kilowatt plant, but of the same general construction as that installed in the present station. The electrodes are of iron, mushroom-shaped, and mounted on ebonite pillars. The size of the gap can be varied from two to eight millimetres by screwing the electrodes to the right or left as desired. The normal working size of the gap is five millimetres.

The spark gap is entirely boxed in to deaden the noise of the discharge, as may be seen in the illustration. Fixed to the pillars are two guard points, which are set to limit the pressure across the gap to a certain amount, in order to protect the condensers.

There are four condenser tanks similar in design to that illustrated in Fig. 3, and consisting of a number of thin iron plates separated by glass plates, and immersed in oil. It will be noticed that the condenser illustrated has a zinc-lined box with a further internal lining of cork. When the condensers are connected in two groups (of two in parallel) in series, the total capacity is 0.07 microfarad, and the corresponding inductance in the oscillating circuit is 2.3 microhenries. The primary of the high-frequency oscillation transformer consists of one turn only, and the secondary of ten turns. Adjustable couplings have been provided in the oscillation transformers in this station, and these permit of a loose coupling being made between the oscillating circuits; in consequence a sharper and more defined wave can be obtained, with improved tuning capabilities. When it is desired to operate with a 600-metre wave, one terminal of the secondary of the oscillation transformer is connected to the aerial, and the other is earthed. As shown in the diagram of Fig. 1, however, a fur-

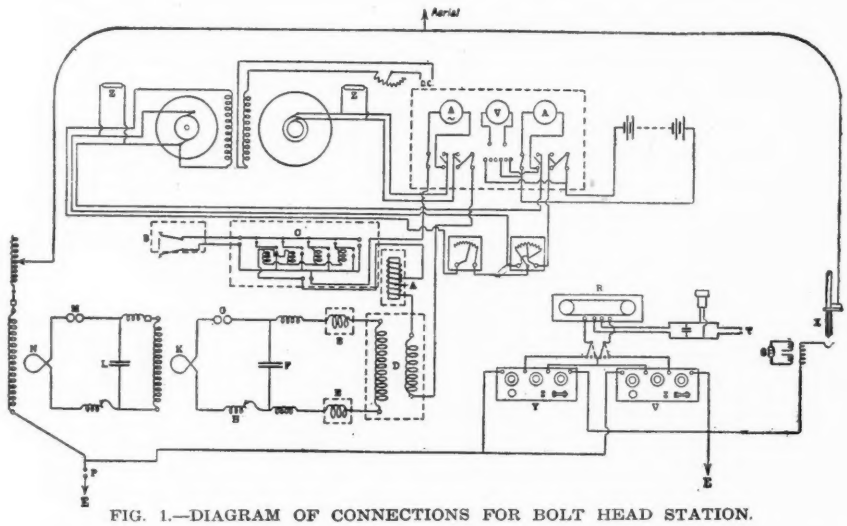


FIG. 1.—DIAGRAM OF CONNECTIONS FOR BOLT HEAD STATION.

ther oscillating circuit can be connected in cascade with the first one for the purpose of working with a different wave length. In that case the secondary of the oscillating transformer *K* is connected across a second battery of condensers *L*, in circuit with which is a second spark gap *M*, a tuning inductance, and the primary of a second oscillation transformer *N*. The secondary of the latter is then connected to the aerial and to earth, as shown in the diagram. In neither case is the aerial directly earthed through the secondary, as a small "arrester" spark gap *P* is interposed between the latter and the earth connection. The function of this will be explained later, but it may be mentioned here that, when transmitting, this gap is practically non-existent, as a discharge to earth occurs every time the aerial is charged.

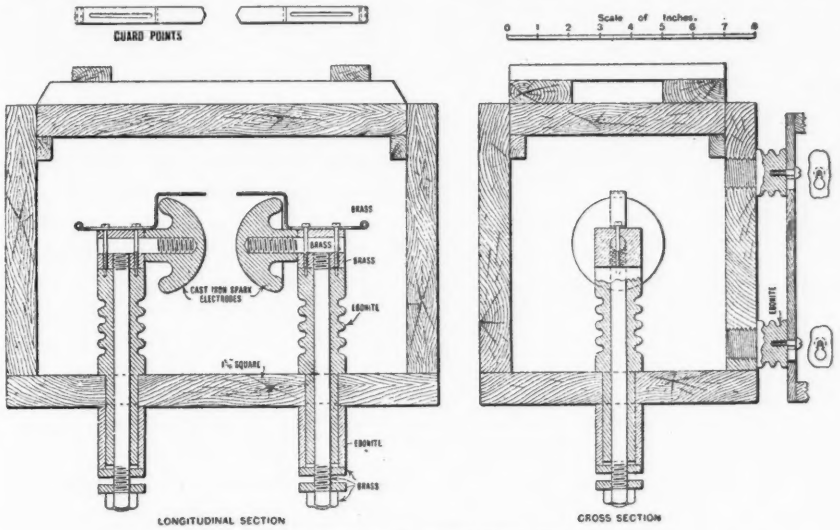
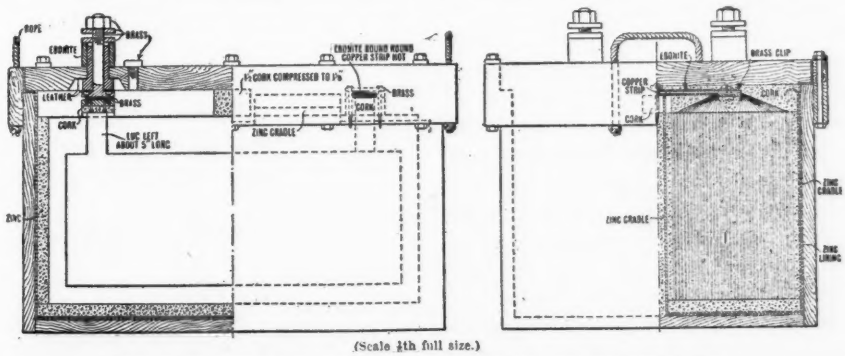


FIG. 2.—SECTIONS OF ENCLOSED SPARK GAP.

The arrangement of the mast and aerial is shown by the sketch of Fig. 4. Four small thirty-foot poles surround the main mast, which is 160 feet high, and the aerial conductors, which consist of stranded copper wire, are supported by wire ropes and ebonite insulators, as shown. The aerial is thus of the umbrella type, with four radiating arms and two central conductors, which terminate at the instrument house. To protect the instruments from lightning, a "thunderstorm switch" is provided. This consists of a metal ring connected to the aerial, which slides on a long ebonite rod; during a thunderstorm this ring is pulled along the rod by means of a cord, extending into the instrument room, until it touches an earthed metal flange at the extreme end of the rod. The aerial is led into the instrument room through a Bradfield insulator. To provide an efficient earth connection, thirty galvanized iron plates have been buried edgewise into a circle round the station, and these are connected by sixty wires to the earth conductor in the instrument room.



(Scale ¼th full size.)

FIG. 3.—SECTIONS SHOWING CONSTRUCTION OF CONDENSERS.

The receiving apparatus is of the usual Marconi pattern, and comprises a magnetic receiver *B*, and a separate filing coherer receiving set *S*, which is connected direct to the aerial, as shown in Fig. 1, and left in circuit when the operator is not using the magnetic receiver, so that an audible bell call can be given. When transmitting, the coherer receiving set is automatically disconnected from the aerial by the switch *X*. The Marconi form of magnetic receiver consists of a moving band of iron wires, which passes through two concentric coils, one of which is connected to a telephone receiver, and the other between the aerial and earth. The portion of the band in the coils at any instant is under the influence of a permanent magnet, and variations in the magnetism of the band, produced by the aerial current, cause corresponding sounds in the telephone receiver. An important feature in this installation is the provision of means whereby the operator can be interrupted while dispatching a message. This is done as follows: Both the magnetic receiving instrument and the transmitting instruments are always connected to the aerial, but the telephone receiver of the former is automatically short-circuited by means of the contacts shown in the diagram of connections at *T*, when the manipulating key *B*, in the transmitting circuit, is depressed. It would not, of course, be practical to have the aerial coil of the magnetic receiver in series with the aerial, either directly or indirectly through a transformer, when transmitting, but this difficulty has been got over by placing the previously mentioned "arrester" spark gap *P* in the aerial circuit, and connecting the magnetic receiver *R* across this gap through the "tuners" *V* or *Y*. This gap, which offers little or no resistance to the current surges during transmission, compels the small induced receiving currents to pass through the receiving instruments. It is evident that were the gap not present, the receiving apparatus would be short-circuited. As the operator always has the telephone at his ear, signals received during the intervals of transmission can be heard.

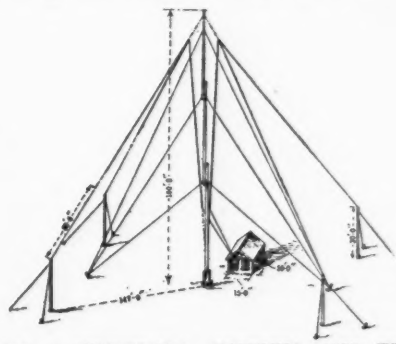


FIG. 4.—UMBRELLA ANTENNA AND EXTERNAL ARRANGEMENTS OF BOLT HEAD WIRELESS STATION.

For tuning purposes, the receiving apparatus includes two units of the latest pattern of the Marconi multiple tuner *V*

and *Y*, the function of which is to tune the receiver or render it immune to interference from other stations. It may also be used for measuring the lengths of the transmitted and received waves, and under certain conditions for estimating the distance of a known station. The *V* unit is for large wave lengths, and the *Y* unit for short wave lengths. The instrument contains three separate circuits called the aerial circuit, the intermediate circuit and the detector circuit. The first consists of a tuning inductance in series with a tuning condenser and an inducing inductance, the latter in magnetic relation with an inductance in the intermediate circuit. In the latter circuit there are two inductances in magnetic relation with the other two circuits respectively, and a tuning condenser in parallel with the inductances. The third circuit consists of an inductance in series with a tuning condenser and the detector or receiver. The two inductances in the aerial circuit and the three tuning condensers are all adjustable, and by means of these adjustments all the three circuits are tuned to the received wave lengths. The oscillations in the aerial circuit then induce oscillations in the intermediate circuit, which in turn induce oscillations in the detector circuit. In addition, the coils in magnetic relation may be moved relatively to one another, so that the couplings between the three circuits may be varied. The instrument is also fitted with a micrometer spark gap and a shunt inductance of the order of 80,000 microhenries, connected between the aerial and earth terminals to prevent the accumulation of an electrostatic charge in the aerial. A change-over switch by means of which the tuned circuits can be cut out, and the receiver instantly rendered sensitive to a wide range of wave lengths, is also provided. One terminal of the aerial circuit is connected to earth, and the other is connected to the top of the "arrester" spark gap, so that connection is made through the secondary of the oscillation transformer *N* to the aerial, as shown in the diagram of Fig. 1. When receiving with this instrument, first the inductances and then the condensers are adjusted until the strongest signals are obtained. The wave length can be read off on one of the dials of the instrument. When the apparatus is left without an attendant, the aerial is connected direct to the filing coherer set *S* by the switch *X;* and this set, in conjunction with a relay and a Morse ink receiver, records all the signals received.

The station is in direct telegraphic communication with Exeter, and messages received from ships at sea are transmitted inland via that city.

Great precautions had to be taken to prevent the magnetic receiver from being affected by the telegraph circuits. The speed of signaling which has been attained with the system used in this station is that usual with key operation—namely, about thirty words per minute. A large ten-inch spark coil is included in the equipment of the station, and this could be supplied direct from the battery, and used instead of the ordinary generating plant, in case of a breakdown of the latter. Attention may also be drawn to the so-called "guard-lamps" *Z*, which are ordinary straight carbon-filament lamps connected across the machines, to prevent the high-frequency oscillations from reaching the armatures. The whole of the wireless apparatus, the mast and the aerial were supplied by Marconi's Wireless Telegraph Company, Ltd., and the generating plant was installed by the Westminster Engineering Company, Ltd., of Willesden Junction, London, N.W.

The cost of the station was about $10,000.

British Government Takes Over Lloyds and Marconi Wireless Stations.

The British government has completed arrangements to take over all the coast stations of the Marconi wireless system, excepting the long-distance stations at Poldhu and Clifton, which the company retains for its projected transatlantic service. The Government pays $75,000 for the stations taken over, and gets also the right to use all existing patents and all improvements made during the next fourteen years. Under the control of the British postoffice, the Marconi stations will be opened for communication equally with all ships, irrespective of their wireless system. The post office department is taking over also all the Lloyds wireless stations.

Wireless in Argentine.

The Radio Telephone Company of New Jersey has petitioned the ministry of the interior for a concession for ninety-nine years to establish radiographic stations in any part of the Argentine Republic, and also on ships flying the national flag. The telegraph board has been directed to report the matter.

The Cable Controversy in Newfoundland.

The Direct United States Cable Company has informed the Newfoundland government that hereafter it will operate its trans-Atlantic cable service by way of Newfoundland. The company has agreed to pay the landing tax required by the colonial statute. The premier of Newfoundland, Sir Edward Morris, declares that this latest development in the cable situation shows that he had ample warrant for his recent refusal to permit the Commercial Cable Company to establish a cable station here. The ministry of Sir Robert Bond, which immediately preceded that of Sir Edward, entered into a contract with the Commercial Cable Company permitting that company to connect its lines with this colony, but shortly afterward Sir Edward became premier and declined to ratify this contract on the ground that it gave the company undue privileges.

North Pole Discovery Helps Telegraphs.

The Great Northern Telegraph Company, Ltd., has had to cope with a great rush of press messages from Denmark since the news of Dr. Cook's arrival from his polar journey, says *The Electrical Engineer* of London. "This is proving a record time for us," the manager remarked to a correspondent. "Up to 8 p. m. Sunday (September 5) we received 50,000 words of press messages about Dr. Cook, and much more is still coming in. We have had to increase our staffs here and at Newcastle, where the Danish cable comes ashore, and we have also had to take in a second cable, which is ordinarily used only for Sweden." The company has been gratified to hear from various newspapers of the accuracy with which the messages, written in English, and transmitted by Danish operators, have been received.

Commercial Cable Company's Taxes.

The Commercial Cable Company has obtained a writ of certiorari from Justice Amend, in the Supreme Court, to review the action of the municipal tax board in assessing its cables and conduits, for the purpose of taxation, at $27,000. The company contended that the tax was excessive, and that it had been taxed on the same property by the State Board of Taxes, and that the intrinsic value of the property was small. The writ is returnable the first Monday in January.

The Telephone in Europe.

Vice-Consul-General Richard Westacott, of London, furnishes the following information, contained in the August issue of the *National Telephone Journal,* showing the number of telephone stations in the several countries of Europe on January 1, 1908, and 1909:

Country.	1908.	1909.
Germany	768,266	851,319
Great Britain	528,763	565,354
France	178,518	194,159
Sweden	150,948	156,000
Austria	108,457	124,825
Russia	97,643	113 000
Switzerland	64,953	69,122
Denmark	60,825	67,339
Norway	49,398	53,726
Italy	44,834	53,721
Holland	43,449	48,134
Belgium	34,818	38,503
Spain	18,545	19,500

Russia has one telephone for every 1,322 persons, Spain one for every 955, Great Britain one for every seventy-seven, the German Empire one for every seventy-one, Denmark one for every thirty-eight, and Sweden one for every thirty-four. Relatively, therefore, Sweden makes more use of the telephone than any other country in Europe.

Telephone Train Dispatching.

The Atchison has recently completed the installation of telephones for train dispatching between Chicago and Newton, Kan., a distance of 659 miles. This road is among the foremost in this use of the telephone and already has eighteen different divisions thus equipped, covering a total distance of 1,925 miles.

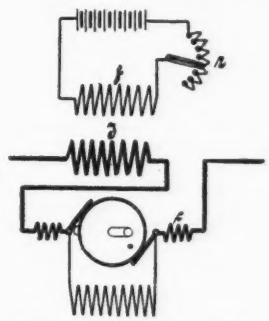
Railroad men are of the opinon that the use of the telephone will afford relief from the present serious shortage of competent telegraphers. In part the shortage is the result of the federal law limiting the hours of employment of railroad telegraphers, and it is feared that the difficulty may become still greater when the fall movement of crops and other freight is in full swing.

Telegraph and Telephone Extensions in Korea.

According to Consul-General Thomas Sammons, at Seoul, the Japanese Residency General authorities state that since taking over the telegraph and telephone lines in Korea, in July, 1905, the total length of the telegraph lines, then about 1,930 miles, of which 895 miles were used for military purposes, has been increased to approximately 7,000 miles. As for the telephone system, five years ago it existed mostly at Seoul, aside from lines on mining concessions, and the total length of the wires was less than 100 miles. Today it exists in all the principal cities with a mileage of 4,500.

A New Machine for Constant Current.

The latest type of constant-current machine of the Felten and Guilleaume-Lahmeyer Company was described by Ch. Kraemer in a paper read at the annual meeting of the Verband Deutscher Elektrotechniker. If a machine is excited by a main current field, and this is annuled by separate external excitation, then every current variation will produce a positive or negative electromotive force; that is, at every current variation there will be a corresponding change in tension. This change in tension may be utilized for inducing a self-excitation in another winding, by means of which, at constant exterior resistance, the current is reduced to a value corresponding to the separate



f—Separately exc.ted field; j—Main field; r—Compensating poles.

CONNECTIONS OF CONSTANT-CURRENT MACHINE.

or foreign excitation, for the self-excitation will compensate the field produced originally by the current variation.

In principle, therefore, the machine is based on the sum of three fields, as shown in the accompanying diagram. The external and self-exciting circuits may be connected in series or they may have separate windings; the method of operation will be the same. The sum of the main field and the external excitation must always be equal to zero so long as the machine is working exactly under its characteristic conditions. All three windings are together on the poles of an otherwise entirely normal machine, which may be provided with compensating poles for the purpose of sparkless running. Since, as explained, the sum of the main field and external excitation must always be equal to zero, it follows that the main current will correspond to the value of the external excitation, which may be adjusted at will by a regulator *r*.

The advantage of this machine over those having similar properties resides in the fact that standard models may be employed, which will work without cross brushes and distorted fields, as well and as sparklessly as a specially constructed machine with compensating poles. This property of automatically changing its tension at constant current in correspondence with the exterior resistance makes it eminently suitable for a number of uses.—*Abstracted from Elektrotechnische Zeitschrift (Berlin), August 26.*

Clarence H. Mackay Denies Rumors.

Clarence H. Mackay, asked about the report that the Postal Company had absorbed the Western Union, says:

"Neither the Postal Company nor the Mackay companies have entered into any arrangement for the purchase or lease of the Western Union or the purchase of its stock, and neither the Postal Company nor the Mackay companies contemplate doing so. Competition will continue."

Navy Department Supplies.

The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will open bids on the dates given below for the following electrical equipment and supplies. Bidders should without delay make application to the Bureau for copies of the schedules they are interested in, being careful to give the number of each schedule. Copies can be obtained on application to the Navy Pay Office nearest each navy yard.

NAVAL SUPPLIES.

Date of Opening.	Material.	Quantity.	Delivery at Navy Yard.	Schedule No.
October 19, 1909	Bells and buzzers	Miscellaneous	Various	1711
	Buttons, push	"	"	1711
	Cells, dry	"	"	1711
	Dynamometers	9	"	1711
	Fuses	50,000	"	1711
	Generators, testing	35	"	1711
	Insulators and hangers	Miscellaneous	"	1711
	Irons, soldering	"	"	1711
	Keyboards, night signal sets	9	"	1711
	Motors	2	Norfolk, Va.	1730
	Plugs, attachment	Miscellaneous	Various	1711
	Sets, testing	15	"	1711
	Sets, ventilating	17	"	1711
	Sockets, miscellaneous	Miscellaneous	"	1711
	Switches	"	"	1711
	Appliances, wiring	"	Mare Island, Cal.	1725
	Wire, copper, insulated	22,000 feet	" " "	1725
	Accessories, wiring	Miscellaneous	Brooklyn, N. Y.	1751
	Fixtures, etc., lighting	"	" "	1751
	Sets, night signal	2	" "	1751
	Strips, glass, searchlight	75 sets	" "	1751
	Tape, insulating, cotton	4,500 pounds	" "	1751

Electrical Notes From Great Britain.

By Our British Correspondent.

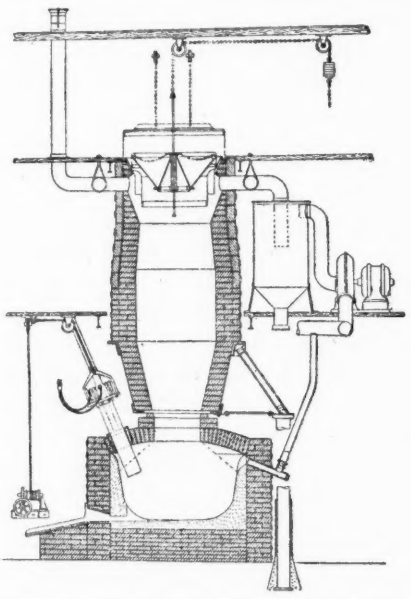
London was the meeting place in the closing week of September for two bodies of men in whose calling electricity plays an important part. The annual Conference of the Municipal Tramways Association came first, its proceedings commencing on September 22 and continuing until September 24. The autumn meeting of the Iron and Steel Institute opened on September 27 and closed on October 1. The two most important electrical communications to come before the Iron and Steel Institute were: "The Refining of Steel by Electricity," by Disponent E. J. Ljungberg (of Falun, Sweden), and "Determination of the Power Consumption of Reversing Rolling Mills," by C. A. Ablett, of London. The Institute will naturally now devote increased attention to electricity every year, as its applications are permitted to make greater headway in British iron and steel works. It is appropriate to mention here that the installation of exhaust-steam turbo-blowing and generating plant that was put down at the noted Bolckow-Vaughan works, in the north of England, has given complete satisfaction to the owners, who have announced that if the results are equally satisfactory for a further three months they will proceed with the extension of the installation throughout their entire steelworks.

Mr. Ablett said that since the last autumn meeting of the Iron and Steel Institute, five steelworks had decided to adopt electrically driven reversing rolling mills, making in all twenty firms which had come to this decision. Twelve such plants are working in different parts of the world, one at least being installed to replace an engine less than ten years old, which was in good condition. The following were given as the reason influencing this decision: (1) Greater economy in fuel consumption; (2) larger output from plant; (3) reduced running costs, *i. e.*, reduction in cost of repairs, attendance, oil, etc., the reduction in the cost of oil being very striking; (4) greater convenience and reduction of management expenses due to centralization of power supply; (5) the great economy of the electrical plant is maintained throughout the life of the plant, and does not diminish as the parts wear. Experience during the last two years had enabled them to reduce the capital cost of an electrically driven reversing mill, but further reductions were scarcely possible unless some entirely new method of reversing-mill driving were evolved in place of the Ilgner system; the present state of electrical knowledge offered little prospect of this. In many cases, however, the greater capital expenditure as compared with a steam-driven mill was justified by the economies possible with electric driving. As saving in fuel consumption appealed most strongly to the steelmakers, Mr. Ablett went on to consider the methods by which economy in fuel, power or steam consumption can be ascertained. He showed various results of tests made by indicating the steam engine, and by measuring the feed water or fuel burnt, and showed that the energy consumption of an electrically driven reversing rolling mill as expressed in kilowatt-hours per ton rolled can be determined in the simplest possible manner by inserting an ordinary integrating wattmeter in the supply system, which instrument could "always be left in circuit and requires no attention." "If a reading of this instrument before the commencement of a shift, and a second reading at the end of a shift, are taken," he said, "the difference gives the total kilowatt-hours used during the shift, and dividing this by the tonnage rolled, the total kilowatt-hours per ton is obtained." Such readings can quite easily be taken for every shift, and a continuous check on the energy consumption can be kept. Results expressed in kilowatt-hours per ton, the author said, were generally found most useful, as the cost of the kilowatt-hour varied according to the local conditions, and, knowing this cost, the total cost of power can be arrived at directly. The efficiency of the electrical plant could also be checked in the simplest manner possible, by placing a second integrating wattmeter in the armature circuit of the mill motor. The paper concluded with some figures showing characteristic values for the kilowatt-hours per ton rolled, from tests on reversing mills, as follows:

Description of Steel Pieces.	Size in Inches.	Weight in Tons of Ingots.	Output in Tons per Hour.	Kilowatt-Hours per Ton.
Billets	4.5×4.5	2.5	53	22.5
Blooms ...	6.0×6.0	2.5	63	17.5
Blooms	8.0×8.0	2.5	80	13.0
Blooms	12.5×9.5	7.0	65	11.2
		(34.5×25.0 ins.)		
Slabs	32.0×9.0	6.0	40	4.3
		(36.0×19.5 ins.)		
Slabs	32.0×5.0	6.0	40	5.8
		(36.0×19.5 ins.)		

Section Rolled.	Weight in Lbs. per Yard.	Weight in Tons of Ingots.	Output in Tons per Hour.	Kilowatt-Hours per Ton.
Flange rails.	100	2.0	30	48.0
Beams	120	1.5	..	36.0
Channels	92	1.5	..	37.0

Mr. Ljungberg in his paper said that in the extensive and costly trials at Domnarfvet, Sweden, in the direct reduction of ore during the past few years, two modifications of a furnace constructed by Mr. Wallin, in Berlin, and several modifications of a furnace by Grönvall and Lindbad, Ludvika, had been tried. The latest form was described. The accompanying illustration shows a furnace similar to a common blast furnace, but with three electrodes fed by three-phase alternating current at about forty volts, sixty cycles, and 9,500 amperes, averaging 674 horsepower, instead of tuyeres. In this furnace, which has been running for 1,903 hours, there have been produced twenty-eight tons of iron, containing from 0.95 to 3.09 per cent of carbon. The furnace consists of a lower portion, or smelting chamber, corresponding to the hearth of a blast furnace, and a top section or shaft. The latter is supported on columns which prevent any weight from bearing on the arch of the smelting chamber. The latter is so proportioned as to provide a considerable amount of free space between the charge and the arched roof, through which the carbon electrodes project into the charge. The



FURNACE DESCRIBED BY LJUNBERG BEFORE THE IRON AND STEEL INSTITUTE.

brickwork is thus protected against any very high temperature and remains a non-conductor of electricity. This, it was stated, was an important feature of this furnace, since experiment had shown that if the electrodes enter the chamber at the point where the charge touches the walls, a very high temperature is generated at this point, the brickwork is destroyed and becomes a conductor of electricity, giving rise to a more or less complete short-circuit. The brickwork may be further cooled by means of a blast of cool gas taken from the top of the furnace and blown in around the electrodes with a fan, no heat being lost by this proceeding. The ore and fuel are crushed to a suitable size, and are fed into the top of the furnace through the bell hopper in the usual way, the ore being partially reduced by the carbon monoxide rising through the charge. The latter spreads out in the smelting chamber, as shown, and the reduction is there completed. Since the electrodes project well into the charge, the highest temperature occurs in the center of the latter, and the brickwork is thus kept cool compared with the walls of an ordinary blast furnace.

Mr. Ljungberg gave figures showing that in the manufacture of the twenty-eight tons referred to there were used: Ore, 442 tons; lime, twenty-four tons; coke, forty-one tons; charcoal, fifty-eight tons; electrodes (total), 6.5 tons; electric current (kilowatt-hours), 891,623.

The author said that the figures showed that the problem of replacing a considerable part of the fuel used in making iron and steel by electric current was technically solved. As regards its commercial value, he remarked, "It is too early to make any definite statement yet, but this will be readily understood by all iron and steel makers when they reflect how many years it has taken to bring the Bessemer, the open-hearth, and the basic processes to their present state of perfection."

The subjects coming before the Municipal Tramways Association included the medical examination of tramway employes, whose fitness for safely controlling heavy high-speed electric tramcars is quite as important as is the fitness of the various brakes to respond immediately and efficiently to the driver's demands. In the interests of the community the elimination or exclusion of the physically unfit is imperative in such a department of the public service, and while medical inspection, efficiently and frequently carried out, may not always detect the man who, given certain conditions, will suddenly develop a fit of the nerves when an emergency arises requiring that all his wits shall be about him, it should go a good way in that direction. The author of the paper on this subject was Councillor Chapman, the vice-chairman of the City Tramways of Manchester, which, of course, employ a large staff of motormen and conductors. The London County Council Tramway Department has lately equipped a big central car repair depot, and an account of this was read by W. E. Ireland, the Council's rolling-stock superintendent. The depot was visited by those attending the meeting, as was also the tramway generating station at Greenwich. Mr. Fearnley, the secretary of the association, and general manager of the Sheffield municipal trolley lines, introduced some comparisons between Continental and British methods of operating tramways, and the question of "Current Consumption" was considered from the economy viewpoint by R. S. Pilcher, of Aberdeen's Tramway Department. A. L. C. Fell, the London County Council tramway manager, delivered the presidential address, and, from some points of view, the most interesting feature of the meeting was a demonstration of the trackless-trolley system in one of the suburbs of London.

Mr. Pilcher thought that no effort to prevent the systematic increases in current consumption which were taking place all over the country, ought to be spared. Track and car equipments were becoming older and top-covers were a contributing factor, and current was wasted in these ways, as well as through defective motor fields, badly worn pinions and gears, bent axles, etc. The importance of giving close attention to the motorman's method of driving the cars was the principal subject handled in the paper. On one English system the author, by instructing the motormen in the series-parallel system of controlling motors, and showing how it was possible to save current without decreasing the speed of the cars, had reduced the consumption by over seven per cent. Three years ago he started a similar system at Aberdeen, and this has been very successful. Each motorman is trained by the aid of diagrams in the best way of running the cars, and when on the road a tactful superintendent watches the progress of their economical efforts, and all drivers are informed of the reductions made. Previous to the introduction of the system at Aberdeen, there was a yearly rise of between six and twelve per cent per car-mile in current consumption, but immediately it was introduced there was a reduction. In the first year not only was the increase checked, but there was a reduction of six per cent, representing a saving of $3,200, and the consumption per car-mile has not since increased, although top-covered cars have been added at the rate of six per annum. All the cars are fitted with ampere-hour meters, and drivers become interested in watching the consumption each trip and each day. The drivers like the cars with the meters. Although several thousands of pounds' worth of current have been saved in Aberdeen during the last three years, there has not been a single motorman suspended in connection with the effort to economize consumption. Mr. Pilcher believes that any tramway having no method of checking current consumption will use at least five per cent more current per car-mile than one having a systematic check upon its drivers. In towns with many steep gradients and few level tracks there is less scope than in fairly level towns. Simultaneously with the introduction of systematic supervision of drivers, Mr. Pilcher noticed a great improvement in the timekeeping of cars and a great reduction in motor troubles.

J. A. Bell, the city electrical engineer of Aberdeen, says that his department has had a unique experience during the past year, this period being the first since the undertaking started, in which there has been an actual decrease in the number of units generated. The units sold, however, have increased, economies in distribution, etc., having been effected, and a good advance has been made in supply to power consumers. Metal-filament lamps to the number of 25,000 have superseded those of the carbon-filament type.

There are further signs that the antipathy of small municipal authorities to bulk power supply companies is on the wane. There is less reluctance to hand over provisional orders already obtained, and an increased disposition to buy energy in bulk and act as the distributing authority only. In September, the municipality of Brighouse, in Yorkshire, superseded its own old-standing generating station, and commenced to take a supply in this way from the Yorkshire Electric Power Company, whose generating station

is at Thornhill. The transformer plant has cost some $15,000, and the Brighouse Corporation will pass on the light and power supply to its own customers. The Farnworth (Lancashire) Urban District Council also in September inaugurated a new plant which it has put down for dealing with supply purchased in bulk from the Lancashire Electric Power Company. The Lancashire company generates a 10,000-volt, three-phase, fifty-cycle supply, and this is stepped down to 500 volts in two 300-horsepower Westinghouse machines for inversion to a 500-volt, direct current by two General Electric 270-kilowatt motor-generators running at 600 revolutions. The Council has for some years had its own generating plant, but instead of putting down additional generators it has made arrangements to buy as above a minimum of 400,000 units per annum. A further step of interest at Farnworth is the inauguration of a front-feed type refuse destructor by the aid of which it is hoped to generate a further 400,000 units per annum.

ALBERT H. BRIDGE.

London, September, 1909.

Two Large Mortgages.

Two mortgages, one for $50,000,000 and the other for $75,000,000, were filed in the office of the Register of Essex County, N. J., in Newark, October 2.

The first was given by the Public Service Corporation of New Jersey and the recently formed Public Service Gas Company to the Fidelity Trust Company, of Newark. The other was given by the New York Telephone Company to the Farmers' Loan and Trust Company.

The Public Service mortgage has been recorded in eleven counties in New Jersey, owing to the fact that the properties which it covers are so widely distributed. It includes all the franchises of the big corporation and the gas companies of the Public Service Gas Company, and the capital stock of the eighty-four underlying concerns of the parent company. It puts up, in effect, as a guarantee for the $50,000,000, all the property it owns.

The mortgage is given as security for 50,000 general-mortgage, fifty-year, five-per-cent, sinking-fund, gold bonds, on which the interest is payable in April and October of each year. It is provided that $13,500,000 of the new issue of bonds will be put out in exchange for the company's present obligations, the remainder according to the needs of the company.

To Test New Recording Compass.

Maritime circles in New York are watching with considerable interest the result of a test of a new recording compass invented by Carl L. Jaeger. The test is being made on the steamship Amelia, that has sailed for the West Indies. Mr. Jaeger, who has been at work on the instrument for seventeen years, in an interview said the new compass will record the direction of the ship's course, the distance it travels and the speed.

The compass is about twenty-four inches long and six inches in diameter. It has the usual needle at the top and a chronometer at the bottom. The record is made by an electric spark perforating a chart that moves up or down within the body of the compass. A perforation is made for each knot traveled. The device makes a permanent record of all important features connected with navigation. It thus makes a check on the ship's log.

Electric power necessary for operation is secured by storage batteries or from the ship's dynamos. Mr. Jaeger will test his invention in every possible way during his four weeks' absence. On his return it is expected that plans will be made to put the compass on the market, provided it is found satisfactory.

Mr. Jaeger has about thirty patents on various instruments, among them an automatic log. He is an associate member of the American Institute of Electrical Engineers.

Waterpower Resources and Railway Electrification.

An American consul in a Latin-American country reports that the local government has engaged the services of an eminent civil engineer to make an exhaustive study of the great waterpower resources of that region, with a view to their development by the government as well as by private interests. Legislation bearing on the subject is now before Congress, and a proposition is being considered for the electrification of the government railways in the near future, as it is claimed a very large saving can be made in operating expenses by using electric power instead of steam as at present. The name of the individual under whose direction the work is being done can be obtained by interested firms by applying to File No. 3840, Bureau of Manufactures, Department of Commerce and Labor, Washington, D. C.

New York's Street and Electric Railway Traffic.

The magnitude of the traffic on New York city's street and electric railroads was well illustrated by the exhibit of the Public Service Commission for the First District in the State Institutions Building at the recent State Fair. On the walls of the Commission's booth were charts, maps and photographs showing actual conditions in the big city, together with statistical tables comparing the transportation business of the large cities of the world.

It is shown, for instance, that the street railways in New York city carry many more passengers in a year than do those of London, which has a population of more than 7,000,000 against a little more than 4,000,000. In New York the figures for 1907 were: New York, 1,323,326,655; London, 871,171,495 passengers.

A profile chart of Manhattan and the Bronx and part of Brooklyn showed the number of tickets sold at the various stations on the subway and elevated lines and over the East River ferries and bridges for every hour of an average day. The Manhattan station of the Brooklyn Bridge showed the highest number of sales in one hour, namely, 29,411, while the Atlantic Avenue station of the subway in Brooklyn came next with 11,000 in one hour.

Trolley Line Sleepers from Chicago to St. Louis.

In a comparatively short time it will be possible to ride in a sleeping car from Chicago to St. Louis over a trolley or third-rail line. This will result from a completion of the road of the Illinois Traction Company between St. Louis and Joliet.

Sleeping cars of the new type are being constructed for this interurban service, and they will be operated between St. Louis and Peoria, Springfield, Bloomington and Danville in limited trains. The company charges two cents a mile, but special rates are made for round trip and special occasions, bringing the average rate down to one-and-three-quarter cents per mile. The freight rates are based on the Illinois Railroad Commission's distance tariff for steam roads. Agents of the company say, however, that their line offers express schedules at freight rates. Another feature of the system is that it allows country merchants to use the company's telephone to order goods from St. Louis, which is a saving to the retailers

Exhibitors at New York Electrical Show.

As already announced in these columns, the third annual New York Electrical Show will be opened at the Madison Square Garden on October 11. The management confidently announces that it has completed all the arrangements to make this show eclipse everything ever attempted in this line. A number of startling innovations are to be looked for The show will close on October 21.

Following is a revised list of exhibitors with their New York city addresses in cases where New York offices are maintained:

American Electric Lamp Company, 153-9 Jefferson Street, Philadelphia.
American Metal Hose Company, 173-77 Lafayette Street.
Automatic Electric Washer Company, Newton, Iowa.
Collins Wireless Telephone Company, 54 Clinton Street, Newark.
Consolidated Telegraph and Electrical Subway Company, 66 Lafayette Street.
Duntley Manufacturing Company, Thirty-fourth Street and Broadway.
Economical Electric Lamp Company, 25 West Broadway.
Edison Electric Illuminating Company of Brooklyn, 360 Pearl Street, Brooklyn.
Electric Cleaner Company, Monadnock Building, Chicago.
Electric Home Supply Company, 45 West Thirty-fourth Street.
ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, 13-21 Park Row.
Electric Suction Sweeper Company, 91 Wall Street.
Electric Storage Battery Company, Philadelphia.
Electrical Testing Laboratories, East End Avenue and Eightieth Street.
Electrical World, 239 West Thirty-ninth Street.
Empire Vacuum Company, 110 West Thirtieth Street.
Excello Arc Lamp Company, 30 East Twentieth Street.
Fox Brothers & Company 126 Lafayette Street.
German-American Electric Company, 110 West Fourteenth Street.
General Compressed Air and Vacuum Cleaning Machinery Company, 315 Fifth Avenue.
General Electric Company, 30 Church Street.
General Vehicle Company, Long Island City.
Goulds Manufacturing Company, 16 Murray Street.
Hurley Machine Company, 949 Broadway.
Keller Manufacturing Company, Philadelphia.
Charles L. Klewert Company, 39 Cortlandt Street.
H. Krantz Manufacturing Company, 160 Seventh Avenue, Brooklyn.
Manhattan Electrical Supply Company, 17 Park Place.
Murpny Electricity Rectifier Company, Rochester.
National Electric Lamp Association, 4411 Hough Avenue, Cleveland.
Otis Elevator Company, 17 Battery Place.
Pelouze Electric Heater Company, 403-13 Ohio Street, Chicago.
W. P. Pressinger Company, 1 West Thirty-fourth Street.
Public Service Corporation of New Jersey, Newark.
Radio Reflector Company, 1178 Broadway.
Roger Williams (The Simplex Electric Heating Company), 25 West Forty-second Street.
Shelton Electric Company, 105 West Forty-second Street.
Southern Exchange Company, 97 Warren Street.
Stanley and Patterson, 23 Murray Street.
Sunray Electric Lamp Manufacturing Company, 109 West Forty-second Street.
Crane Company, 1200 South Canal Street, Chicago.
The Heany Company, 25 Broad Street.
The Lansden Company, Newark.
The New York Edison Company, 55 Duane Street.
The Westinghouse Electric and Manufacturing Company, 165 Broadway.
Tucker Electric Construction Company, 110 West Thirtieth Street.
United Electric Light and Power Company, 1170 Broadway.
United Shoe Repairing Machine Company, 39 Warren Street.
Watson-Stillman Company, 30 Church Street.

Advertising of the right kind in the right place at the right time cuts the salesman's work in two.

New York and New Jersey Telephone Company's Past Earnings.

In view of the obliteration, so to speak, of the New York and New Jersey Telephone Company in the New York Telephone Company, a retrospective glance at its financial status during the past ten years will illustrate the value of the property and its successful work to date, as follows:

	Outstanding Capital Stock.	Gross Earnings.	Net Earnings Applicable to Dividends.	Dividends Paid.
1908...	$25,235,000	$9,269,407	$2,400,037	$1,766,275
1907...	25,235,000	8,807,093	2,138,740	1,697,311
1906...	18,930,500	7,447,147	1,700,864	1,272,797
1905...	16,578,700	6,217,283	1,446,016	1,034,150
1904...	13,770,100	5,393,709	1,476,951	962,088
1903...	12,520,000	4,741,344	1,290,133	852,215
1902...	11,430,100	3,962,597	972,789	707,627
1901...	9,375,000	3,376,433	907,695	616,286
1900...	7,500,000	2,827,481	634,147	490,650
1899...	6,000,000	2,381,369	621,620	398,850

An interesting fact in connection with the rise and progress of the company is the increase in the number of subscribers' stations. In 1883, when the total capitalization outstanding amounted to $2,400,000, the number was 3,673. At the end of the last fiscal year 157,645 availed themselves of the telephone facilities through subscription.

The dividend rate of the New York and New Jersey company has been as follows: 1883, three per cent; 1884 and 1885, four-and-one-half per cent; from 1886 to 1894, inclusive, six per cent; and from 1894 to the present time, seven per cent.

The Wheatstone Telegraph System in Australia.

According to *The Transmitter*, the Australian government telegraph authorities have decided to install the Wheatstone telegraph system in several provinces in that commonwealth. This system is in use at present to some extent in Melbourne, and no additions are to be made to the equipment in that city. The provinces in which new apparatus is to be installed are New South Wales, Queensland, South Australia and Western Australia. Before deciding to install the Wheatstone system in the provinces mentioned, Sir John Quick, postmaster-general, received a report from F. G. Creed, of Glasgow, the inventor of the Creed perforator, which, among other things, said that the British Post Office during a recent trial handled on a single wire all traffic between London and Edinburgh, and occasionally gave Glasgow a helping hand. There are ordinarily six duplex Morse wires employed between these stations, and the traffic is sometimes very heavy; they once handled a total of 500 messages in a single hour in both directions.

Changes Its Subway Proposals.

The Interborough Rapid Transit Company, of New York, in a letter sent by President Shonts to the Public Service Commission, modifies its proposal to construct subways through Lexington and Third avenues by substituting a plan to build a four-track road along Madison Avenue, starting from Thirty-eighth Street. The company now proposes to construct a line along Madison Avenue to about 138th Street, thence across the Harlem River to 146th Street, thence dividing, with two tracks to a connection with the West Farms division of the present subway at 149th Street and Girard Avenue, and two tracks from 146th Street up River Avenue to a connection with the proposed MacComb's Dam extension of the Sixth Avenue elevated. The west side elevated line is to be modified so as to meet the projected subway at about 161st Street and River Avenue, and is to be continued up River and Jerome avenues to 194th Street as a three-track elevated road.

The modification of the plans, which is regarded as a surrender on the part of the Interborough, is the result of several conferences recently held between Chairman Willcox and President Shonts; and the last letter was a direct answer to a communication sent by the Commission on August 27. It is not known whether the Service Board will accept the Interborough's new proposition, or will insist upon the construction of the Broadway-Lexington Avenue subway planned by the old Rapid Transit Board. Mr. Shonts' former proposal did not have the approval of the Commission.

Successful Use of Telephones for Train Dispatching.

The adoption of the system of dispatching trains by telephone instead of telegraph on the Canadian Pacific Railroad has proved that fully fifty per cent more traffic can be handled by the former than by the latter.

In June of last year the company put in operation a telephone circuit between Montreal and Farnham, Quebec, and it proved satisfactory in every way. Since then the company has strung other telephone lines, and in western Canada today it has 531 miles of telephone lines.

It is the intention of the company at once to string a telephone line between Winnipeg and Brandon, 133 miles, and within a year it will have 1,000 miles of its system operated by telephone.

BOOK REVIEWS.

"Motorman's Practical Air Brake Instructor." By George R. Denehie. Frederick J. Drake & Company, Chicago, Ill. Morocco, 280 pages (4½x6¾ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $1.50.

The days of the hand brake and mechanical friction brake for street and suburban electric cars have come and gone, and such appliances are now regarded by leading and experienced railway officials as being inadequate to meet the demands of modern electric passenger transportation. As is suggested by the title, this treatise treats of the more modern form of brake, namely, the air brake, and the author has taken considerable pains in collecting, condensing and compiling all of the latest available information bearing upon this most important subject, with the view in mind of offering to motormen and conductors the means of possessing something more than a mere knowledge of how to apply and release brakes. As is aptly stated in the opening chapter, trainmen should understand the mechanical principles represented in the brake, and should know how to detect, remedy and report any and all kinds of defects which may arise.

Beginning with a full and clearly illustrated description of the Westinghouse A. M. A. brake equipment, especially adapted to electric traction work, each of the other types of straight air, and automatic service is taken up, and its construction and operation clearly explained and plainly illustrated. This includes the National Straight Air Brake Equipment, not only for straight air, but as adapted for automatic service also. The General Electric Company's air brake in all of its details; the Christensen air brake, both straight and automatic, is fully described and illustrated, also the Westinghouse S. M. E. equipment. Considerable space is also given to electric brakes and friction brakes.

"Alternating-Current Motors." By A. S. McAllister. McGraw-Hill Book Company, New York, N. Y. Cloth, 322 pages (5¾x9 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $3.00.

The third edition of this book has appeared in a revised and enlarged form. A comparison of the present edition with the second will show that the essential features of the recently developed "split-pole" variable-ratio synchronous converter are discussed in the simplest possible terms. There has been added a chapter on "Synchronous Motors" in which all of the characteristics of this machine, both as a motor and as a condenser, are fully treated, and the chapter on the "Prevention of Sparking in Single-Phase Commutator Motors" has been expanded to include the recent improvements in commutating-pole motors.

In selecting the methods of presentation, choice has been made of the treatments which serve to impart the maximum of information with the minimum of confusion. The general method of treating all methods is first to outline the theory roughly, then cover the discussion, again, adding the details. For example, in Chapter XIII the physical phenomena involved in the operation of single-phase commutator-motors are treated in the simplest possible manner without any reference to the mechanical dimensions or electrical constants. In Chapters XIV and XV, however, these motors are discussed in detail and the relations between the several parts of each machine are treated both algebraically and graphically.

The phenomena of induction motors are dealt with separately in Chapters II, VI, VIII and IX. In Chapter II the entire treatment is concentrated on the secondary circuit, the modifying influences of the primary quantities being temporarily ignored. In Chapter VI it is shown that, in its effect upon the primary quantities, the secondary circuit may be considered as composed of a constant reactance and a variable resistance. Chapter VIII gives a rigorous discussion of the operation of induction motors, and Chapter IX contains an analysis of the magnetic field in induction motors.

In addition to the enlarging and revising, the book contains all of the features which made the first and second editions a valuable work for students of alternating-current machines.

"The Protection of Railroads from Overhead Transmission Line Crossings." By Frank F. Fowle. D. Van Nostrand Company, New York, N. Y. Cloth, 70 pages (5x7½ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $1.50.

The rapid progress made in the development of high-tension power transmission has given rise to a number of new problems which, though of secondary importance to that of transmission, are quite important to the electrical field as a whole. One of the most important of these is the problem of safeguarding persons and property from exposed transmission lines. It is coming to be regarded more and more that high-tension transmission lines are agencies of the most dangerous character and an increasing amount of attention is being paid to the subject of protection at all places of hazardous exposure.

This work treats of protection of railroads from these overhead high-tension power transmission lines only, the general problem of protection being a broad one.

The author does not believe it feasible to prepare a general specification which will cover all crossings of high-tension lines and steam railroads; hence in treating the subject he has indicated or outlined a form of specification which covers the general principles involved, the materials to be used, and the types of construction, without going into such details as naturally pertain to individual crossings.

Several approved types of protected high-tension crossings are taken up, together with comparisons of old types. The book contains many illustrations which help to simplify the discussion.

"Electric Power Conductors." By Wm. A. Del Mar. D. Van Nostrand Company, New York, N. Y. Cloth, 339 pages (5¼x7¼ inches), illustrated. Supplied to the Electrical Review and Western Electrician for $2.00.

To the users of power conductors, this book should prove valuable, as it gives a clear account of all of the engineering considerations which affect the purchase and use of such conductors. The book will be found practical and up-to-date, being based upon notes prepared by the author for his own use.

The arrangement of the book follows the rational order of the series of engineering considerations which affect the purchase of conductors, namely, the determination of material, insulation, and size, the specifications, test, and installation.

The text is made as brief as possible and where explanation or theoretical discussion is advisable, the text is supplemented by appendices. Diagrams, tables and formulas throughout the book supplement the discussion, and should prove beneficial to the readers.

To Rebuild Pittsburg Incline.

The Pittsburg Railways Company, of Pittsburg, Pa., closed the Knoxville incline on August 16, for ten days, to rebuild it. The incline has been materially strengthened to accommodate the heavier cars now being used. New and special safety devices were also added.

AMONG THE CONTRACTORS AND SUPPLY MEN

To know what is going on among the men who do things and those who supply the material for the doing, is always interesting. "Actualities," the actual happenings of the day with the contractors and the men who furnish them with supplies of all kinds, accurately reported from all parts of the country, is the object of this department.

THE WIEKS BOILER COMPANY, Saginaw, Mich., was the lowest bidder for the furnishing of three vertical 200-horsepower boilers for the city's waterworks and electric-light plant.

THE CINCINNATI ENGINEERING COMPANY, Cincinnati, Ind., has been awarded a contract to construct and equip a water and light system in Jasonville, Ind. Work will begin soon, under the supervision of Laurent Lowenberg.

THE CITY COUNCIL OF TEKOA, Wash., has awarded a five-year contract for the placing of cluster lights on First Avenue as follows: To the Olympia Foundry Company, for furnishing posts, $3,440, and to the Aguttor & Griswold Company, for supplying conduits, $24,538.

THE GREAT WESTERN POWER COMPANY'S bid for a franchise for erecting poles and stringing wires along the streets of Oakland, Cal., for light and power purposes has been accepted by the City Council.

THE WESTERN ELECTRIC COMPANY, Los Angeles, Cal., announces that on June 1 last it succeeded to the business of the California Electric Company, of Los Angeles.

J. J. AND J. M. KELLY, contractors, Winnipeg, Manitoba, have been awarded the contract for the erection of the new branch telephone exchange in that city for $43,000, while the Northern Electric Company will install the switchboard for $150,000. R.

THE CAMERON ELECTRIC COMPANY, Emporia, Pa., has secured the contract from the city of Seattle, Wash., for next year's supply of incandescent lamps for the city.

THE E. D. CROWLEY COMPANY, of San Francisco, has been awarded the contract for constructing a power plant at the Mare Island navy yard, San Francisco, Cal., at $50,894.

THE HENRY J. SPEICHER COMPANY, Toledo, Ohio, has been awarded the $100,000 contract for the Toledo plant of the General Electric Company on Friday of this week. The structure will be 300 feet long, eighty feet wide and four stories high. It will be constructed of reinforced concrete, and when completed will be utilized by the Toledo Lamp Company for the manufacture of the tungsten incandescent electric lamp. H.

THE HANDLAN-BUCK MANUFACTURING COMPANY, St. Louis, Mo., has recently closed a contract with the Waterloo Drop Forge Company, Waterloo, Iowa, for furnishing a complete drop-forge equipment, with the exception of the drop hammers, including 135 horsepower in electric motors, power presses, lathes, planers, millers, shapers, drills, and miscellaneous tools, amounting to approximately $25,000.

John R. Morris is president and general manager and F. B. Johnson, superintendent of the Waterloo company, which will engage in the general drop-forge business, making a specialty of high-grade forgings for automobiles and other kindred work, together with manufacturing of high-grade tools on which they have secured a number of patents. Strange as it may seem, this plant will at the start be the largest drop-forge works west of the Mississippi River, and will be equipped with high-grade machinery throughout.

The machine shops and forge room will be lighted with Stave "Flaming" arc lamps, for which the Handlan-Buck Manufacturing Company is the western agent.

THE W. H. OCHILTREE COMPANY, Pittsburg, Pa., reports the following contracts at the present time:

Complete electric-light and power installation in the filtration plant for the city of Pittsburg, Pa. Two of the interesting features of this contract are that all fixtures and apparatus are watertight and all conductors are insulated with thirty per cent pure Para rubber, covered with a layer of jute, which is covered with one-eighth-inch lead sheathing, and this in turn is protected by two layers of steel tape armor. Contract to be completed in May, 1910.

The Lincoln Public School, of Pittsburg, now near completion. This is an old building, which is being wired with B. X., and the installation comprises about 125 tungsten chain fixtures, and 125 250-watt frosted-bowl tungsten lamps, together with necessary switchboards, etc.

The C. L. Flaccus Building, at Pittsburg, Pa., which will be completed in a few days. The roof garden of this building is attracting considerable attention. Also the contract for a complete electrical installation in the new office building for the Brotherhood of Locomotive Engineers Building, Cleveland, Ohio, which was received some time ago, and work on which will be started about October 4.

GEORGE W. JACKSON, INC., Chicago, Ill., has secured the contract to build the main section of the Washington Street tunnel at Chicago, and excluding competitors by more than $150,000.

D. W. COOLEY, Waterbury, Conn., has been awarded the contract for building the concrete dam, gates to the penstock and foundation for the power house of plant No. 2, for the big storage basin and dam in East Montpelier. The dam will be 150 feet long and twelve-and-one-half feet high and will have a fall of thirty feet.

THE EUREKA ELECTRICAL AND CONSTRUCTION COMPANY, Eureka, Cal., has secured a contract for the erection of an electric-lighting plant at the works of the Little River Redwood Lumber Company at Little River, near Eureka.

THE ELECTRIC SUPPLY AND FIXTURE COMPANY, Ogden, Utah, has just completed the installation of a steam-turbine electric power plant for the Southern Pacific Railroad Company at Carlin, Nev. The contract discloses, among other machines, two twenty-five-kilowatt, direct-connected, 230-volt multipolars, furnished by the Westinghouse company. The plant will furnish power and light for the railroad shops and the town of Carlin. N.

BARTLETT & KLING, Cedar Rapids, Ia., announce that they are ready to let sub-contracts for plumbing, heating, electric wiring, plastering and terrazzo work for a six-story fireproof office building in Cedar Rapids, the contract for which has been awarded to them.

PERRY-MANN ELECTRIC COMPANY, INC., Columbia, S. C.—At a meeting of the stockholders of W. M. Perry Electric Company, Inc., held October 2, it was unanimously agreed to change the name of the company to that of Perry-Mann Electric Company, Inc. Application was made to the secretary of state, and the charter of the company was amended accordingly. The business will be conducted under the same management, the change in name being made in order that both stockholders should be represented in the firm name. The following officers were elected: W. M. Perry, president; M. L. Mann, secretary and treasurer.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

MONTREAL STREET RAILWAY.

The report of the Montreal Street Railway Company for the month of August and eleven months ended August 31, 1909, compares as follows:

	1909.	1908.
August gross	$ 355,229	$ 329,772
Expenses	183,582	164,262
August net	$ 171,647	$ 165,510
Charges, rent, etc	50,026	54,112
August surplus	$ 112,620	$ 111,397
Eleven months gross	3,492,776	3,329,059
Expenses	2,078,398	1,978,659
Eleven months net	$1,414,378	$1,350,400
Charges, rent, etc	418,801	423,021
Eleven months surplus	$ 995,576	$ 927,379

CHICAGO RAILWAYS.

The report of the Chicago Railways Company for July and six months ending July 31, 1909, compares as follows:

July:	1909.	1908.
Passenger earnings	$1,049,277	$ 939,944
Miscellaneous	28,416	22,615
Total gross	$1,077,693	$ 962,559
Operating expenses, maintenance and taxes	709,967	614,263
Balance	$ 367,725	$ 348,295
Thirty per cent of gross	323,306	288,766
Interest on property, 5 per cent	186,881	141,645
Net earnings	$ 136,426	$ 147,122
City's share, 55 per cent	75,034	80,917
Company's share, 45 per cent	61,391	66,204

Six months total gross, $6,034,488, expenses, $4,060,401, balance $1,974,087, thirty per cent of gross $1,810,346, interest on property $1,045,772, net earnings $764,574, city's share fifty-five per cent $420,515, company's share forty-five per cent $344,058.

NASSAU ELECTRIC.

The New York Public Service Commission has ordered a hearing for October 6, on the application of the Nassau Electric Railroad Company for permission to issue $730,000 in bonds. The purpose of the issue is to retire an equal amount of first consolidated mortgage bonds of the Atlantic Avenue Railroad Company, falling due October 1, 1909.

NORTHERN OHIO TRACTION.

The report of the Northern Ohio Traction and Light Company for the month of August and eight months ended August 31 compares as follows:

	1909.	1908.
August gross	$ 231,061	$ 209,741
Expenses	115,724	107,356
August net	$ 115,337	$ 102,385
Charges	43,703	43,381
August surplus	$ 71,634	$ 59,004
Eight months gross	1,432,015	1,248,875
Expenses	784,739	731,393
Eight months net	$ 647,275	$ 517,482
Charges	350,414	348,593
Eight months surplus	$ 296,861	$ 168,889

MEXICAN TELEGRAPH.

The report of the Mexican Telegraph Company for the quarter ended September 30, 1909, compares as follows:

	1909.	1908.
Traffic receipts	$ 157,000	$ 160,000
Expenses	38,000	42,000
Net	$ 119,000	$ 118,000
Other income	25,500	26,000
Total income	$ 144,500	$ 144,000
To Mexican government	7,500	7,500
Balance	$ 137,000	$ 136,500
Dividends	89,735	71,752
Surplus	$ 47,265	$ 64,747
Previous surplus	2,144,308	2,559,849
Total surplus	$2,191,573	$2,624,596

CENTRAL & SOUTH AMERICAN TELEGRAPH.

The report of the Central & South American Telegraph Company for the quarter ended September 30, 1909, compares as follows:

	1909.	1908.
Traffic receipts	$ 371,000	$ 365,000
Expenses	163,000	165,000
Net	$ 208,000	$ 200,000
Other income	2,200	4,500
Total income	$ 210,200	$ 204,500
Dividends	143,565	143,565
Surplus	$ 66,637	$ 60,935
Previous surplus	1,562,890	1,279,132
Total surplus	$1,629,525	$1,340,067

LAKE SHORE ELECTRIC.

The report of the Lake Shore Electric Railway Company for the month of August, 1909, compares as follows:

	1909.	1908.
August gross	$130,993	$119,674
Expenses and taxes	55,822	54,749
August net	$ 75,171	$ 64,925
Interest	33,852	33,749
August surplus	$ 41,318	$ 31,175

BOSTON SUBURBAN.

The combined earnings' statement of the subsidiary companies of the Boston Suburban Electric Companies, comprising the Newton & Boston, Lexington & Boston and Middlesex & Boston Street Railway companies, and excluding the operations of Norumbega Park and the Waltham Gas Company, for August last, is as follows:

	1909.	1908.	Increases.
Gross earnings	$89,970	$90,522	*$ 552
Expenses	56,535	54,926	1,608
Net earnings	33,434	35,595	*2,160
Interest	13,409	13,015	393
Surplus for dividend	20,025	22,580	*2,554

*Decrease.

AMERICAN LIGHT AND TRACTION.

The report of the American Light and Traction Company for the month of August and eight months ended August 31, 1909, compares as follows:

	1909.	1908.
August gross	$ 236,410	$ 194,872
Expenses	8,214	4,000
August net	$ 228,195	$ 190,872
Eight months gross	2,017,491	1,605,721
Expenses	71,405	32,000
Eight months net	$1,946,086	$1,573,721

PUBLIC SERVICE CORPORATION OF NEW JERSEY.

The authorization by the directors of the Public Service Corporation of New Jersey of an issue of $4,750,000 new stock, or about twenty-five per cent of its present outstanding stock, is accompanied by an increase in the rate of dividend from four to five per cent annually. The higher rate of dividend applies to the declaration for the present quarter, which is a disbursement of one-and-one-quarter per cent, payable September 30. The new stock, which brings the amount issued up to $23,750,000, out of the authorized capital of $25,000,000, will be issued pro rata at par to stockholders of record October 1.

With the increase in stock a bond issue of $8,000,000 was authorized under the new general mortgage covering $50,000,000 fifty-year five per cent bonds ratified over a year ago. The $8,000,000 now to be put out have been sold to J. P. Morgan & Company, and, according to a statement issued after the meeting by President McCarter, will be used chiefly to retire the $7,250,000 five per cent collateral trust gold notes due on November 1 of this year. The proceeds of the sale of stock are to go to finance the improvements which the company has had in contemplation for some time. In commenting on the increase in the dividend rate, President McCarter says:

"The action of the directors in putting the stock on a five per cent annual dividend basis was taken upon the recommendation of the executive committee, after a careful consideration by that committee of the favorable showing which the company is making both in the increase in its business and the economical operation of its properties."

AMERICAN TELEPHONE.

The American Telephone management made the most explicit statement when the last bonds were sold in November, 1908, that this would finance the company through 1910. It is not expected that any financial arrangement will be considered this year.

Authoritative information is that no financial plans for the future are in any way under consideration, and that nothing in the line of new issue, either stocks or bonds, are in contemplation.

BIRMINGHAM RAILWAY, LIGHT AND POWER.

The report of the Birmingham Railway, Light and Power Company for the month

of August and eight months ended August 31, 1909, compares as follows:

	1909.	1908.
August gross	$ 181,979	$ 172,068
Expenses	100,036	105,630
August net	$ 81,943	$ 66,438
Eight months gross	1,458,461	1,404,375
Expenses	811,916	820,582
Eight months net	$ 646,535	$ 583,793

CHICAGO RAILWAYS' EARNINGS.

The Chicago Railways Company has prepared figures showing the increase in its business and earnings during the last year, as a result of the rehabilitation work that has been done and the installation of new cars. In ten months, from December 1 last year to September 30 this year, the company's gross earnings were $9,854,000, as compared with $8,668,000 in the corresponding months of 1907-08. The increase was $1,185,000, or fourteen per cent. The earnings by months in those periods compare as follows:

	1908-9.	1907-8.	Increase.	%
December	$ 949,260	$ 833,719	$ 115,541	14
January	917,357	794,388	122,969	15
February	850 200	716,023	134,177	19
March	963,655	840.743	122,912	15
April	975,440	847,220	128.220	15
May	1,032,511	884,775	147.736	17
June	1,021,582	913,594	107 988	12
July	1,049,277	939.943	109.334	12
August	1,061,364	959.167	102.197	11
September	1,033,961	939,048	94.913	10
Ten months	$9.854,607	$8,668,620	$1,185,987	14

METROPOLITAN WEST SIDE ELEVATED.

The Metropolitan West Side Elevated Railroad Company's report for the year ended June 30, 1909, compares with the years ended June 30, 1908, and the calendar year ended December 31, 1907, and 1906, as follows:

	1909.	1908.
Gross	$2.734.284	$2,809,483
Expenses	1,393.630	1,457,152
Net	$1,340.654	$1,352.341
Other income	9,795	5,016
Total income	$1,350,449	$1,357.357
Charges	1,066.626	1,070,780
Surplus	$ 283,823	$ 286.577
Dividends	.....	65,320
Surplus	.....	$ 221,257

BRONX GAS AND ELECTRIC COMPANY.

The application of the Bronx Gas and Electric Company for the approval by the New York Public Service Commission of a bond issue of $1,500,000 has been adjourned by Commissioner Maltbie pending further investigation. The company intends to issue only $740,000 of this amount, of which $550,000 is to redeem outstanding bonds. The objection that is raised by the Commission is the fact that the brokerage firm that is commissioned to underwrite this amount asks the sum of $30,000 for the work.

The Commission will continue further hearings on the matter in the near future.

Boston Street Railways Merger.

That the Boston Elevated Railway Company is planning to secure control of the Boston & Northern, the Old Colony, the Blue Hills, the Boston & Worcester, the Middlesex & Boston and the Lexington & Boston Street Railway systems has been known in a way that permits of no doubt.

The initial step to bring about enabling legislation was taken by the Boston Elevated, through its counsel, Frederic E. Snow, who appeared before a special commission in advocacy of the proposition. This commission consisting of the Massachusetts Railroad Commission and the Boston Transit Commission, gave its first public hearing at the State House on kindred subjects, and Mr. Snow named the companies referred to above and gave reasons for turning their control over to the Boston Elevated. Better transportation could be given, he said, if the Boston company were allowed to own and operate the lines with which it has physical connection.

The law of the state permits of consolidation of connecting street railways, but the Boston Elevated cannot take advantage of it because of a charter provision that it shall not charge more than a five-cent fare. Hence, if it consolidated with the Boston & Northern, for instance, it would be obliged to carry a passenger a long distance for five cents. This would not be necessary if, instead of consolidating with the connecting lines, it bought the controlling interests in them and thus dictated the operations. Authority to acquire such control is sought by the Elevated, and the Commission is asked to recommend it to the Legislature.

Underground Tramway.

An American consular officer in Latin America reports that the officials of a tramway company have presented to the local municipality the outline of a plan for the construction of an underground tramway system to extend under the entire city.

The company has made a deposit to guarantee the fulfillment of its obligations and will undertake to complete the construction, at a cost of $21,250,000, within about three years of the signing of the contract.

Particulars in relation thereto can be obtained on application to the Bureau of Manufactures, Department of Commerce and Labor, Washington, D. C., reference being made to File No. 3855.

Brunswick Terminal and Railway.

With enlarged property and public-utility holdings, the Brunswick Terminal and Railway Securities Company, Brunswick, Ga., has materially strengthened its resources. The company, formerly called the Brunswick Dock and Improvement Company, has recently acquired all the public utilities of Brunswick, Ga., which include the Mutual Light and Water Company and the Brunswick & Suburban Railroad Company. The first-named company is earning fifteen per cent on its stock, while the traction company has just completed six miles of track, with equipment of the latest type. From $5,000,000 the stock of the new company has been increased to $7,000,000. There are no bonds or preferred stock.

With the acquirement of these properties the total holdings consist of 3,600 city lots in Brunswick, 3,200 acres of land, seventeen miles of water mains, twelve miles of gas mains, thirty-two miles of electric-light wires, and six miles of electric street railway.

To Sell Traction Company.

Judge Holt, of the United States District Court at New York, has signed an order authorizing the sale of the Westchester Traction Company at Ossining, N. Y., on a date to be fixed by the special master appointed by the court for that purpose.

Judge Holt has directed that no bid for the property under $1,200 be accepted. Each bidder will be required to deposit $600 or a note on any trust company in this city.

A mortgage on the property to be sold was given by the Westchester Traction Company to the New York Trust Company on April 12, 1902.

Denies Third Avenue Company's Application.

The New York Public Service Commission has denied the application of the Third Avenue Bridge Company for a certificate of public convenience and necessity to form the basis of an application to the Board of Estimate for a franchise to operate surface cars on the Queensboro Bridge.

One of the principal reasons given for the decision of the commission is the belief of the board that the company is a dummy one. It is a subsidiary concern of the Third Avenue Railroad Company and is composed of stockholders who are employes of that corporation.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

Small Motors.

The General Electric Company has recently placed on the market a new line of alternating and direct-current fractional horsepower motors. These have been termed the "drawn shell" type, due to the fact that they have their field and stator iron securely bound in shells drawn from plates of steel.

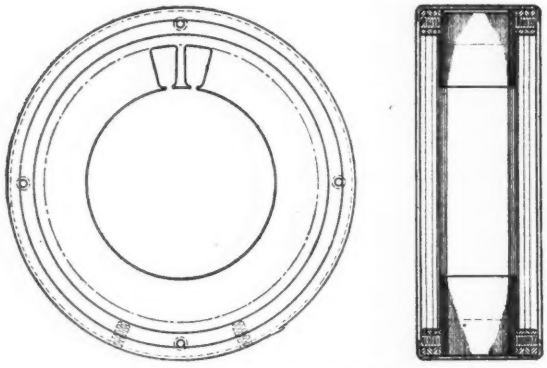


FIG. 1.—MOTOR FIELD STRUCTURE

The fields of the direct-current motors are built up of punchings, a construction which secures much smaller diameters than is possible with the usual cast-steel or iron-magnet frames.

The field and stator punchings are assembled under compression, with thick punched rings to serve as spacers for the end turns of the winding, and the whole is pressed into a steel shell. The edge of the shell is spun over, securely holding the iron in place. This construction is shown in Fig. 1.

These steel shells or frames for both direct and alternating-current motors are cylindrical, and have no lugs or projections whatever. They are placed on an arbor, and the rim is trued and grooved to receive the heads, which are made of cast-iron. The heads are machined on centers to fit the frame, consequently the whole structure of the motor is correct; an accurate air gap and alinement of bearings is the result.

The standard base is shown in Fig. 2 and this is securely held in place by two screws tapped into the magnet frame.

The shafts of all motors are of ample size and the bearing linings are of bronze.

The induction motors have high power factor, efficiency, and liberal overload capacity, with moderate heating. This is evident from the curves in Fig. 4. The windings are of the concentric type, and the starting coils are automatically cut out by a switch when the motor has reached a suitable speed. A centrifugal clutch is furnished when necessary.

Since the frames are cylindrical and without lugs and projections they may be fitted with ease to any form of support, and the heads may be turned through any angle to permit of the motor being inverted or attached to a wall or vertical bracket.

This method of construction eliminates the outside frame of cast-iron that is usually employed, as well as the necessity for all holes through the active iron. It also makes possible accurate methods of manufacture, which insures perfect concentricity of parts and an alinement not usually found when the common cast shell is used.

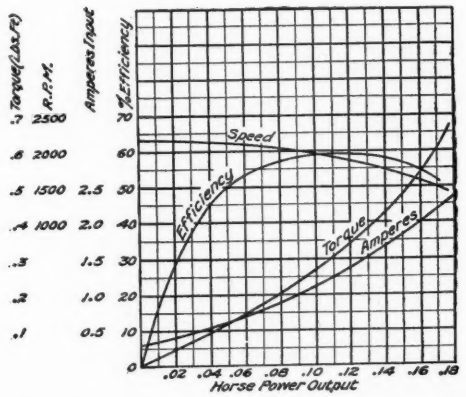


FIG. 3.—TYPICAL CURVES OF DIRECT-CURRENT MOTORS.

These motors are supplied to meet all commercial circuit conditions of voltage, and, in the case of the induction motors, can be supplied for the various frequencies with either single or polyphase winding.

If one wishes to have direct and alternating-current motors of the same dimensions so as to use them interchangeably, it will be necessary to interchange an alternating-current with a direct-current motor of the next larger capacity. Their electrical characteristics are clearly shown by the curves in Figs. 3 and 4.

The motors are very compact, light in weight and of fine workmanship. They are adapted to such service as driving sewing machines, small lathes, automatic musical instruments, air pumps, small

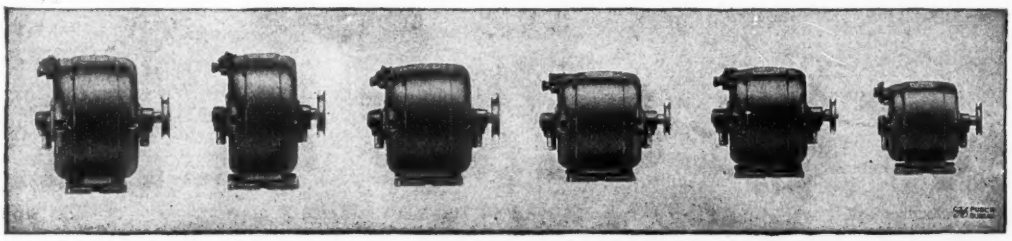


FIG. 2.—COMPLETE LINE OF ALTERNATING-CURRENT MOTORS.

blacksmith forges, dental instruments, jeweler's tools, pumps, buffing and grinding tools and a large variety of small special machines.

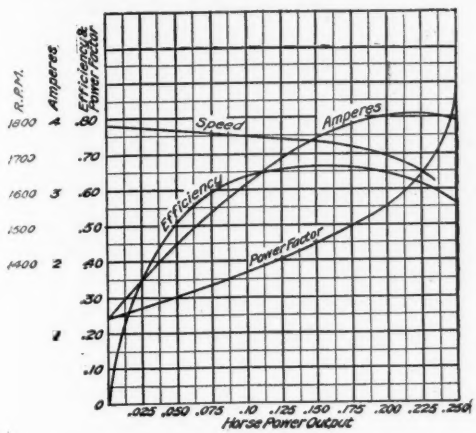


FIG. 4.—TYPICAL CURVES OF ALTERNATING-CURRENT MOTORS.

New Wire Building for the Diamond Rubber Company.

That the insulated wire business of the Diamond Rubber Company has advanced very rapidly is evidenced by the new six-story factory building now being erected. This structure, 371 feet long and 103 feet wide, will be used principally as an addition to the already extensive equipment of the insulated wire and cable department. Although this department is but three years ald, the original capacity has been doubled already three times.

The equipment is complete in every detail for the manufacture of all classes of National Electrical Code Black Core, Red Core intermediate compound, thirty per cent Para and high-grade specification wires and cables, lead-encased cables, and a complete line of igniter cables for gasoline and other explosive engines.

Continuous wire-drawing machines, annealing and tinning furnaces, insulating machines, both longitudinal and tubing, single and double braiding machines, vulcanizing and wax tanks for saturating, and two lead presses—one now installed and the other in process of construction in Germany—are a part of the machinery necessary.

The Diamond Rubber Company asserts that the great output of this department in three years' growth has been due in a large measure to an absolute knowledge of correct rubber chemistry, resulting in the removal from the raw material of all elements that tend to hasten disintegration or deterioration in the finished product.

A New Pliable Insulating Material for Floors.

For some time past an insulating material possessing high insulating qualities and also strength and durability, has had considerable attention. The careful and exhaustive tests which have been conducted by the foremost experts in electrical engineering have shown the practical value of a large number of materials, among which is that known as "Electrose." For the past seven years this material has been extensively used on electric-railway, light and power installations with most satisfactory results.

The success with which this material has met along these lines has led to a development of a new insulating flooring. The Electrose Pliable Insulating Flooring, recently invented by Louis Steinberger and placed on the market by the Western Electric Company, is a new development and is being used extensively in connection with high-tension switchboards. It is also used as a protective covering for floors and walls adjacent to high-tension apparatus. This insulating flooring possesses not only extraordinary dielectric properties, but also has a uniform composition. On an official test, a slab twelve inches by twelve inches by three-eighths inch arced over at 89,000 volts without puncturing, which gives an idea of its dielectric strength. The material is permanently pliable, very tough and strong, thoroughly waterproof, and possesses a dull surface, which will not become smooth or slippery from wear. It is made in various colors and of practically any size or thickness.

The material conforms to any inequalities of a floor upon which it is laid, and while the standard form of the material is pliable, it can be made, if desired, very hard and inflexible. When installing the covering, the slabs are placed on the floor or secured to a wall and spaced about one-quarter of an inch apart. A cement made of the same material is then poured, or otherwise applied, between the slabs. When this cement "sets" (which will occur within ten minutes of time of application), a homogeneous mass is formed which becomes an integral part of the slabs.

The Electrose flooring may be sawed, planed or drilled and nails may be driven through it without danger of cracking or otherwise injuring it. The material naturally clings to the floor or other surfaces upon which it is laid, and does not curl at the edges or corners, thereby not making it necessary to secure the material to the floor, except under certain conditions—when the slabs are small and it is necessary to keep them from moving along the surface of the floor.

In those cases where the Electrose Pliable Insulating Flooring has been laid in power stations having high-tension switchboards, this new floor insulating material has given thoroughly satisfactory results.

Jewel Electric Washers.

One of the new electrical devices which is being favorably received by electrical dealers and central stations is the Jewel electric washer which is being manufactured by the American Washer Company, of St. Louis, Mo. For central stations this device should offer a means for enabling an increased sale of current for domestic purposes.

The Jewel washer, while very simple in construction, is guaranteed by the manufacturers for its strength and durability. It confines both the operations of washing and wringing to one machine, carrying out both without the aid of the hands.

The field of usefulness of this device is large. It is made in types and sizes sufficient to supply the varying demands of private families, hospitals, small hotels, boarding houses, boarding schools, small laundries, cafés, restaurants and similar institutions.

The manufacturers are carrying on an extensive advertising campaign, advertising particularly in journals and magazines which have a large circulation among women.

New Factory of the Moore Electrical Company.

The Moore Electrical Company has recently purchased its new brick factory at 167-171 Malvern Street, Newark, N. J. The building is forty-two by 100 feet, of mill construction, three stories in height, with 16,000 feet of floor space and cement basement. The building is well lighted on all sides and has skylights over the third floor. The plant includes a complete generating equipment and freight elevators, and is complete and modern throughout. This space will provide proper manufacturing facilities for the constantly growing business of the Moore light. The first floor is used for the glass department and shipping. The machine shop and offices are located on the second floor and the engineering department is on the third floor.

FLAME ARC-LAMP CARBONS.

BY K. ODWALD.

Flame carbons are radically different from the so-called pure carbons, and one has to put them in a class by themselves. Their distinct feature, compared with pure carbons, is the extremely *long,* but intensely *luminous, arc* which they produce when properly used.

In the selection of the core material care must be taken to use arc-enlarging ingredients which do not vaporize, but decompose into minute particles which move along the arc and are brought to intense incandescence by the high temperature.

The larger percentage of light then comes from the arc proper, while with common carbons the arc itself is inefficient, most of the light coming from the craters of the carbons.

These principles have been known for years, since arc lighting was in the first stages of development. While the superiority of the "chemical carbon" had been fully recognized at that time, it did not find practical application because the lamp mechanism was in a crude and primitive state, and arrangements for ventilation were inadequate. The light produced was unsteady, the flame smoked badly, and the color of the light did not suit the taste of the time.

For two decades nothing had been done to improve upon the good start which had been made until with the dawn of this century the problem found its solution.

COMPOSITION OF THE MODERN FLAME CARBONS.

The exact proportion and nature of the ingredients is, of course, a factory secret; the main substance, however, is, for the yellow carbon, a compound of calcium, while the white carbons are principally composed of material similar to that of the Welsbach mantle. These substances, mixed with powdered carbon and binder (silicate), are filled into carbon tubes.

The study of the operation of flame carbons for direct current has shown that it is advantageous to use a negative carbon without the chemical core. It is a fact that the direct-current arc is steadier with a pure carbon negative and a chemical-core positive electrode. For alternating current, of course, both carbons must be alike, both have chemical cores.

SPECIAL DETAILS OF LAMP CONSTRUCTION AND CARBON STRUCTURE.

Experiments with chemical carbons in the first stages of their development have shown that thin electrodes with high current intensity produce a steadier arc than those of larger diameter.

In order to get reasonably long burning hours it was necessary to make the carbons very much longer than those of the common arc. To place these long thin pencils co-axial was not feasible on account of the extreme length of the lamp frame. The only way out of this difficulty, then, was to put them in inclined positions, side by side. This departure of the former practice brought a number of new constructive details for the lamp:

(1) The blow magnet.
(2) The sliding negative guide plate.
(3) The economizer and reflector.

THE BLOW MAGNET.

To prevent the arc from traveling upward along the carbons, the magnetic blow (very extensively used for high-amperage switches) was put into service. In addition to the blowing action the magnet has a tendency to hold the flame in position; *i. e.,* to prevent its wandering.

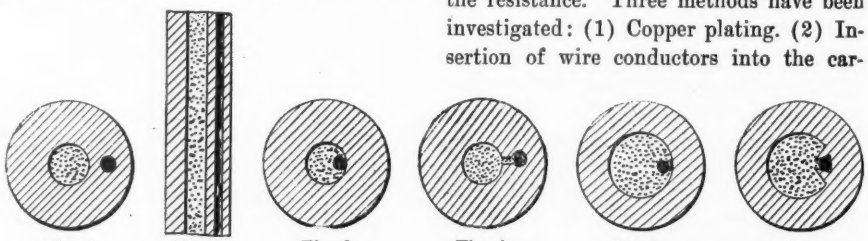


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6.

VARIOUS WAYS OF ENCLOSING AN AUXILIARY CONDUCTING WIRE.

THE ECONOMIZER.

After all, it is the application of heat concentrated on the carbon tips which is essential for the production of the arc. To economize this electrically generated heat is important for a highly efficient source of light. The porcelain cup called the "economizer" conserves the heat, keeps away disturbing air currents, and at the same time acts as a very effective reflector. A further feature is that the gases which accumulate in the economizer are not rich in oxygen; *i. e.,* they reduce, or act as a check on mere cumbustion.

THE SLIDING GUIDE.

Though the manufacture of carbons has advanced today to a stage where uniformity of the product is practically perfect, there are always small differences in homogeneity. To adjust for the changes which the arc resistance suffers from these variations in structure and to take care of unavoidable fluctuations in the supply voltage, the sliding guide, which moves the negative carbon to or away from the positive, has been added to the governing mechanism. This guide also plays an important part in the striking of the arc.

THE CARBONS.

There are today two kinds of flaming arc lamp carbons: For inclined arrangement; for co-axial arrangement.

The carbons burning in inclined position are very long in proportion to their diameter. This ratio is about 1:60 for the seventeen-hour lamp. It is clear that the ohmic resistance of these electrodes should be very much higher when the lamp is newly trimmed than when the carbons are nearly consumed. As a matter of fact, the resistance of each carbon proper for the seventeen-hour lamp is about one-half ohm; *i. e.,* the voltage drop would be about ten volts for a ten-ampere lamp. To eliminate these disadvantageous conditions various expedients have been tried. The leading idea is, of course, to reduce the resistance. Three methods have been investigated: (1) Copper plating. (2) Insertion of wire conductors into the carbon. (3) Current admission near the carbon ends.

COPPER PLATING.

This method has not proven reliable. The copper film forms beads on the carbon tips which suddenly drop and very often splash against the globe, causing breakage. Adjacent beads may fuse together and prevent the adjustment of the carbon distance; or, in other words, the lamp will be short-circuited.

INSERTION OF WIRE CONDUCTORS INTO THE CARBON.

The insertion of a wire of proper alloy is, today, the best solution of the problem. There are, however, different ways to accomplish this. First, the wire was put in by hand in a canal near the core, but through the carbon proper (Fig. 1). These carbons gave pretty good results, due to the irregular contour of the wire affording a sort of spring contact with the carbon, but this method was expensive. Later this operation was done by machinery, but then the wire had to be pulled through nearly straight, and burning tests showed that the contact between

wire and carbon was not good, the wire being loosely held in the channel.

Some patents have been granted for the use of corrugated wire in order to insure proper contact by spring action (Fig. 2). Some carbons give good results, others fail. They are not uniform and the wire loses the temper, so reducing the contact. Others placed the wire in the core (Fig. 3). As the main center of heat, however, is in the core, the wire vaporized eruptively and threw out part of the core, so reducing the light-emitting material.

The best method today used is that of Siemens and shown in Fig. 4. The core material enters the side recess and presses the wire to the carbon, insuring good contact. This form of carbon is uniform in consumption and avoids all of the difficulties enumerated above.

cations apply as for the regular carbons.

As the arc of the flaming arc lamps is especially sensitive to air currents care should be taken that the globe is not cracked and that the ventilation is arranged properly according to the lamp construction.

All measurements should be made with the globe in place. The investigation should include: (A) Shape and position of the arc. (B) Form and appearance of the carbon ends. (C) Deposits. (D) Condition influencing the rate of carbon consumption. (E) Color, steadiness of arc and light output.

The arc should build up between the two cores, and stay in this position quietly. Only here and there it will wander to the carbon shell, but it should return quickly to the core.

Little beads of the core material will occasionally appear on the outer sides of the shell, having found their way through some of the larger pores. These beads usually drop on the ash-tray; sometimes, however, when the arc approaches, they suddenly evaporate, radiating a short flicker of brilliant light. The fluctuations of light caused by these occasional irregularities cannot be avoided with flame carbons; one might say they are part of the carbons' character.

The position of the inserted wires relative to one another should be such that the wires shall be separated as widely as possible.

With co-axial (vertical) carbons the ends of the carbons when burned under proper conditions should be dark black. The little beads may be present, but they will not disturb the arc. As the arc length is very great, freezing is practically impossible. There is no crater formed, either on the positive or negative; the arc wanders slowly around and both carbons are consumed equally. As a general rule co-axial flame carbons are about double in diameter and little less than half the length of the inclined carbons of same amperage and burning hours. This changing of arc position does not have a bad effect on the light distribution. The long arc with broad, radiating surface will not cause pronounced shadows of carbons or carbon holders. The source of light not being concentrated in one point, but sending out rays against obstructions from different directions, does not throw heavy shadows of the rods along which the carbon holders slide. See Fig. 7.

With inclined carbons the shape of the arc may be compared with the form of a bean pointed near the negative and round near the positive carbon. The core of the arc is highly luminous. The surrounding part is less effective and spreads, fanlike, around the carbon points. The position of the arc, under normal conditions, is in the plane of the carbons. The best efficiency is obtained with the arc in position, as indicated in Fig. 8.

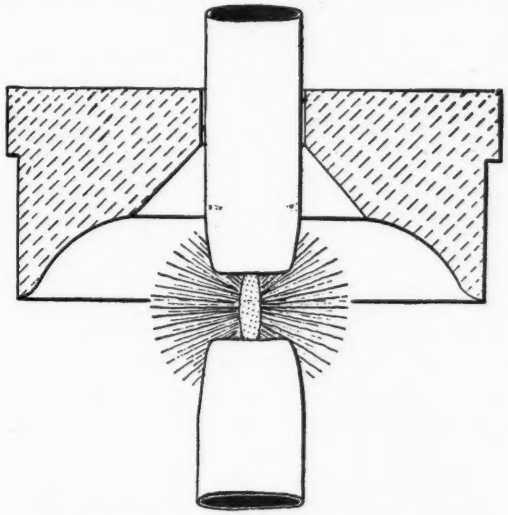


FIG. 7.—THE FLAME ARC WITH CO-AXIAL CARBONS.

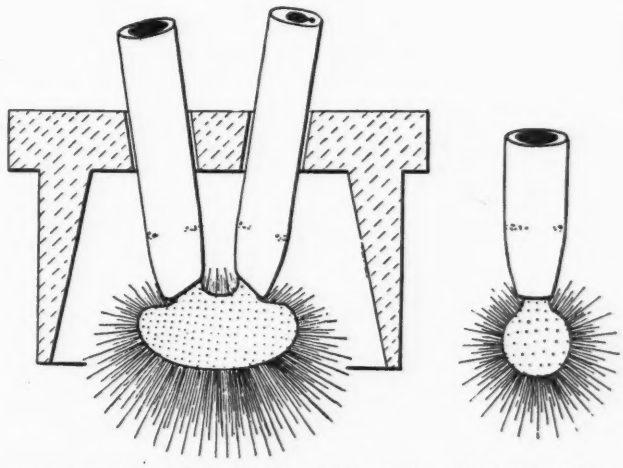


FIG. 8.—FRONT AND SIDE ASPECTS OF THE FLAME ARC WITH CONVERGING CARBONS.

For carbons with a thin shell, *i. e.*, carbons with small diameter, the cross-section used is similar to that shown in Fig. 5; *i. e.*, the wire may be placed in the side of the core. A recent patent (Siemens) improves upon this method, as shown in Fig. 6. To insure good contact in the carbon holder, the wire is flattened on the upper end and bent over.

CURRENT ADMISSION NEAR CARBON ENDS.

Some deposit formed during the consumption of the carbons will settle between the sliding contact and the carbon and prevent proper conduction of the current. This method has been practically abandoned.

TEST FOR QUALITY AND PROPER CARE OF THE CARBONS.

As far as straightness and uniform thickness are concerned, the same specifi-

DEPOSITS.

The white powder, the product of disintegration and combustion of the chemical core by the arc must be taken carefully into consideration for the construction of the lamp feeding mechanism. A well ventilated lamp, *i. e.*, a lamp in which this product of the lamp is carried off by properly controlled air currents, is important for reliable service. The air-admitting ash-tray needs close attention, and the greatest care in designing must be exercised in order to proportion correctly

the length and cross-sectional area of the ventilating ducts.

CARBON CONSUMPTION.

The diameters of the positive and negative flame carbon for direct current differ as a rule only one millimetre, while the cross-section of the negative of pure carbon is only one-half of that of the positive. The consumption of flame carbons, however, is practically equal to that of the pure soft carbon for the open arc. The position of the arc in the economizer also changes and variations in ventilation influence the consumption materially.

COLOR AND LIGHT OUTPUT.

Inclined flame carbons make it possible to change the color of the light from the arc. White, yellow and red may be secured. Yellow, however, is the most

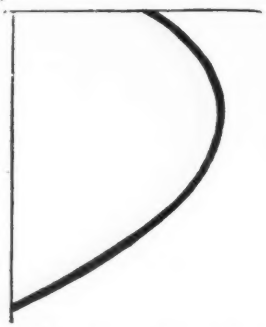


FIG. 9.—LIGHT DISTRIBUTION WITH CONVERGING CARBONS.

efficient and especially effective where penetrating power, as in smoke-filled foundries, etc., is demanded.

"Alba" carbons, for white light, have about the same efficiency as the yellow inclined carbons.

While the light output of "Alba" carbons and the yellow inclined carbons is about the same, the distribution is altogether different. Fig. 9 shows the distribution of light which the inclined carbon arc produces. The maximum goes straight downward. When the lamp is hung very high (thirty feet or more), the actual distribution obtained is more satisfactory, as the light can spread.

Wherever the lamp is hung lower (eighteen feet and less), the "Alba" vertical arc carbon with a characteristic distribution as indicated in Fig. 10, gives better results. The light spreads over a very much larger surface than that which could be illuminated with the same intensity by the inclined carbon arc.

While the limits where the one or the other type is best suited cannot be indicated very closely, there are two separate fields in which one or the other type may be used to the greatest advantage.

Blackburn-Smith Feed-Water Filters.

A six-inch Blackburn-Smith feed-water filter has been installed in the Marion power station of the Public Service Railway Company of New Jersey, to eliminate the oil which had heretofore reached the boilers in considerable quantity. At this plant there are twenty-five 625-horsepower boilers, arranged in five batteries, and carrying a pressure of 200 pounds. Each battery is served by one filter, which has sufficient capacity for handling 150,000 pounds of water per hour. The exhaust steam from Curtis turbines and their auxiliaries is condensed and used again as feed water, but it was found that the open heaters did not catch the oil present in the condensed

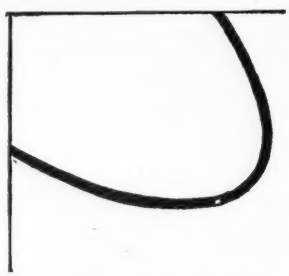


FIG. 10.—LIGHT DISTRIBUTION WITH CO-AXIAL CARBONS.

exhaust steam from these auxiliaries. The new filtering arrangement, as provided by the Blackburn-Smith filters, now passes all the feed water through two separated layers of the linen Terry cloth at the last point before the water enters the boilers. In this way both make-up water and condensation are given a final clarification, after which there is no possibility of the introduction of further impurities. The water reaches the filters at a pressure of about 230 pounds and at a temperature of about 208 degrees, but neither this pressure nor temperature affects the efficiency of the filters. The filtering surfaces are kept clean by renewing the media on the cartridges when they are replaced by the spares. This operation is quickly performed, as the swing bolts which hold down the cover of the filter are easily loosened and the cover is swung to one side by means of a crane, which is furnished as part of the filter. The oil retarded in this instance is plainly noticeable by the discoloration of the cloth of the two foul cartridges resting against the foundation, in comparison with the spare one, which is being put into place. These foul cloths are afterward boiled out in soda and kept in readiness for use again at the next cleaning.

Blackburn-Smith filters are made by James Beggs & Company, 109 Liberty Street, New York.

Allis-Chalmers Steam Turbines.

The Allis-Chalmers Company has recently received orders for steam turbines aggregating a total of 25,225 kilowatts. Recent contracts for new machines comprise turbines ranging from 300 to 3,000 kilowatts for generating current in a great variety of industries. Among the purchasers of large units are the Nashawena Mills, New Bedford, Mass., where two 3,000-kilowatt units, as well as one of 500 kilowatts, will be installed; the Whitman Mills, New Bedford, Mass., 2,000 kilowatts; the Wilmington City Electric Company, Wilmington, Del., 1,500 kilowatts, and the Paine Lumber Company, Oshkosh, Wis., which has contracted for 1,000 and 500-kilowatt turbines. The Diamond Rubber Company, of Akron, Ohio, manufacturer of rubber wearing apparel, automobile tires and rubber novelties, has purchased a 1,250-kilowatt low-pressure turbine.

Sales of 500-kilowatt turbines have been made to the Byron Weston Company, Dalton, Mass.; Sheffield Car Company, Three Rivers, Mich.; E. I. Dupont De Nemours Company, Wilmington, Del.; Coventry Company, Anthony, R. I.; Alexandria Electric Company, Alexandria, Va., and two units for the Casparis Stone Company, for operation in its plants at Patterson's Creek, W. Va., and Havre de Grace, Md.

The National Conduit and Cable Company, Hastings-on-Hudson, N. Y., has bought a 750-kilowatt turbine, and the Ponemak Mills, Taftville, Conn., has contracted for a 600-kilowatt turbine. Two 375-kilowatt low-pressure turbines are to be installed in the plant of the Cherry River Paper Company, Richwood, Va., and one in the plant of the Virginia Electric Power and Water Company, Virginia, Minn.

The Taylor Iron and Steel Company, High Bridge, N. J., will put in operation a 300-kilowatt Allis-Chalmers steam turbine. Sales for turbines of the same capacity have also been consummated with the Noblesville Heat, Light and Power Company, Noblesville, Ind.; Citizens' Lighting Company, La Salle, Ill.; Huntington Valley Light and Power Company, Jenkintown, Pa., and the Pacific Lumber Company, Wilmington, Cal.

MODERN METHODS IN THE CREAMERY.

A SUCCESSFUL CHICAGO EXPERIMENT WITH AN OZONE DEODORIZER.

Strange as it may seem now, the Pure Food Law passed by Congress a few years ago did not include in it the requirement of labeling all butter made from stale cream as "manufactured from stale cream," but the loop-hole was left open and stale cream is made into butter every day all over the country.

Many creameries mix their stale cream with the fresh cream, and all of it is finally made up into butter. The reason the creameries get stale cream is that the farmer now separates his milk and cream with his own separator and brings it to the railroad for shipment only once or twice a week. Naturally cream separated, say on Monday, will not be fresh on Thursday when it reaches the creamery, and so on through the week. Some years ago before the farmer became rich and independent, he was obliged to bring his milk each morning to the creamery at the railroad. The cream in this way would reach the city creamery fresh every day, and rarely ever was received in a stale condition. Now it is all different.

The creameries have long tried to find some way to deodorize and freshen up the stale cream. Several experimental stations have worked out different methods, employing forced air, and it was found that the active principle in the air to take up the rancidity, etc., in the cream and milk was the oxygen, and better still, ozone which is condensed oxygen. This being proved without any question of a doubt, it remained for someone to take further along experiments in this line.

For some years past, since the application of ozone to dairy products was thought possible, has this subject claimed the attention of various agricultural colleges in various parts of the country. Some have advocated it while others have been non-committal, and not until early in March, 1909, did the subject receive an impetus sufficient to bring it to the immediate attention of several large creameries in Chicago. The stumbling block heretofore has been the generating of ozone in sufficient commercial quantities, and above all the purity of the gas to be used; moreover, the application of the gas itself to raw milk, cream, etc., had been little experimented with owing to the scarcity of pure ozone gas.

The National Air Filter Company, of Chicago, has developed an ozone generator particularly adapted for the complete deodorizing and purifying of stale milk and cream. After making numberless tests in its own laboratory, the company proceeded to find a creamery large enough where a prolonged run and test could be made so as to determine exactly the merits of the ozonizing process on a definite quantity of raw milk or cream. An arrangement was obtained with a creamery in Chicago to make this test on raw milk and cream each day as it was received from the country. A 100-gallon agitator was installed alongside a battery of eight 1,500-gallon primers connected to shafting, etc., the same as the rest of the plant complete.

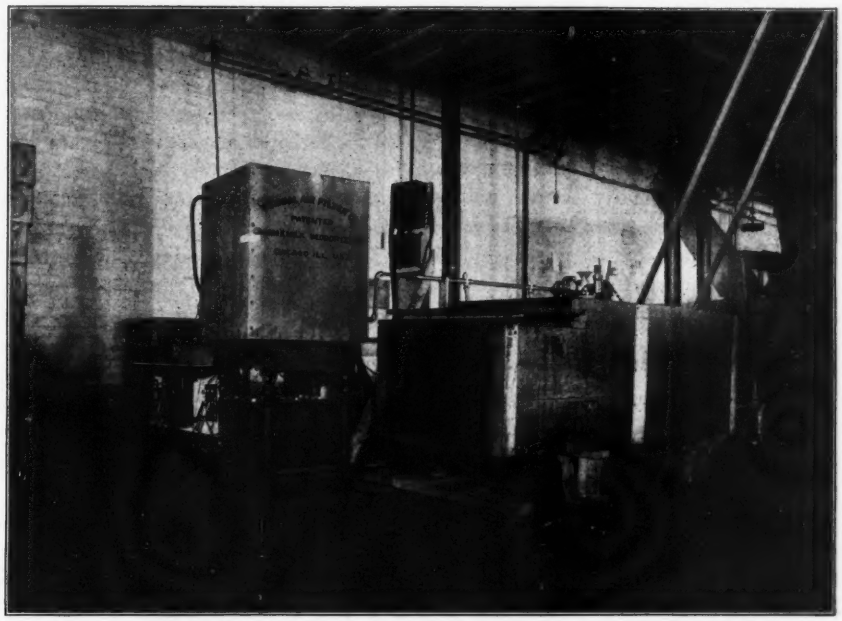


FIG. 1.—SHOWING NATIONAL OZONIZER AND CREAM AGITATOR.

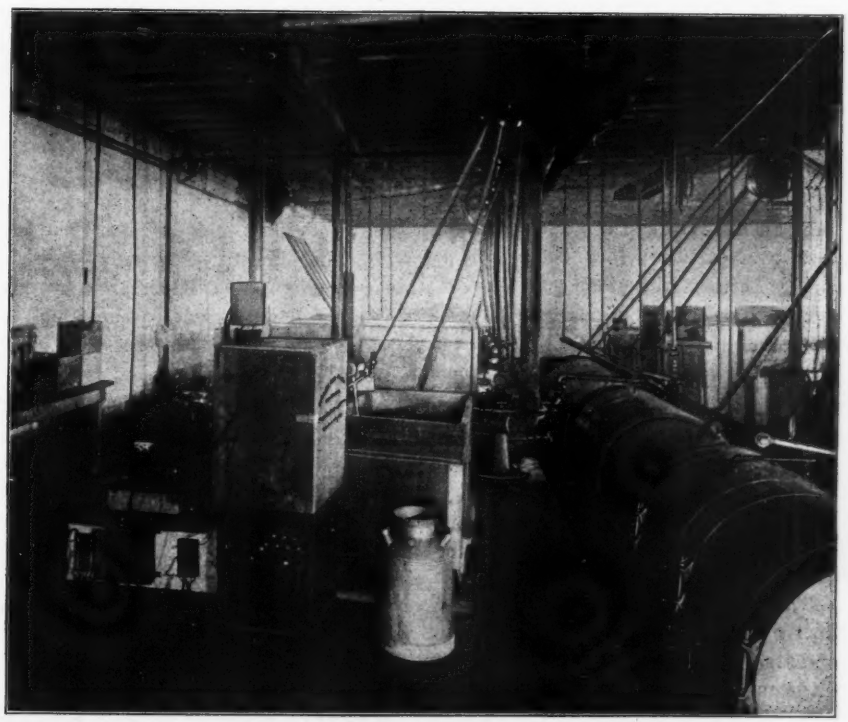


FIG. 2.—ANOTHER VIEW OF OZONIZER AND AGITATOR.
The pasteurizer is in the extreme background of the picture, and the churns are shown to the right.

In sampling the raw cream in cans,

those that were quite stale and foul-smelling were set aside until about eighty gallons were obtained which ordinarily would be condemned as unfit for use. This was first put through the pasteurizer at a temperature of 130 degrees; from there it was promptly run into the agitator and treated with ozone for forty minutes, and at the end of this period the cream was bleached and completely deodorized, the acidity being reduced from 0.7 to 0.36. After being cooled it was churned into butter grading up to No. 1. On subsequent runs the results were duplicated with the exception that in one case, through the carelessness of the operator, too much ozone was taken up by the cream and the butter tasted strongly of "mountain air."

It was found that the best results were obtained in deodorizing stale cream after pasteurizing and at a temperature of 110 degrees, and the length of time for ozonizing this stale product varies, of course, with its age. The cream subjected to the above tests varied in age from two to five days and the rancidity was pronounced, of course, prior to ozonizing. Subsequently, however, the cream was fresh and palatable, making No. 1 grade butter. The treatment of unskimmed milk showed a large reduction in the acidity, while leaving the butter fats, etc., unchanged.

The National ozonizer used in these tests is constructed on the same general principles as that described in our issues of June 26 and August 28 last. In this particular instance, however, the dry filtered air is forced by the electric air pump at a rate of about four cubic feet per minute through the ozone generator, the ozonized air being discharged into the bottom of the agitator at as fast a rate as may be desirable to suit the exigencies of the sample under treatment. In creameries which have an output of 50,000 pounds of butter per day and are operated on a large scale, the ozone generator is installed so as to discharge directly into the pasteurizer, thereby saving one operation and time consumed.

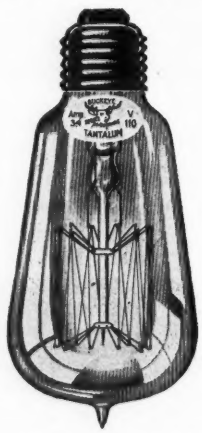
The application of ozone to the process butter industry opens up a large field, and time will tell when ozone will be applied to the other arts little thought of now.

More than 15,000,000 miles of single wire are used by the people of the United States in communicating with each other over telephone and telegraph lines.

Tantalum Lamps for Railway Service.

The Buckeye Electric Company, Cleveland, Ohio, has recently put on the market a tantalum lamp, in sixteen and thirty-two-candlepower sizes, specially designed for use on street railways. These high-efficiency lamps use only about four-sevenths as much power per candlepower as the carbon-filament lamps, inasmuch as they consume but 2.3 watts per candle as compared with the ordinary four watts per candlepower of the carbon lamps.

Important advantages claimed for the new lamps are: (1) They are economical in operation, considering cost of power plus renewals. (2) The candlepower is not greatly affected by the voltage variations ordinarily occurring on street-railway systems. (3) The light has a splendid color quality. (4) The light is comparatively free from glare, especially so when lamps are frosted. (5) The lamp has



TANTALUM RAILWAY LAMP.

a life equal to that of the carbon lamp. (6) The filament is extremely rugged in construction. (7) The lamp is extremely economical in current consumption, thus permitting current to be available for overload on the motors when required.

The installation of these lamps presents no difficulty, as there are no changes to be made in the car or in the wiring.

The lamp has been thoroughly tried out under actual operating conditions on several different roads and has given the highest satisfaction in every case.

A fine exhibit of these lamps was made by the Buckeye Electric Company at the street-railway convention in Denver, Colo., this week, where the new lamps occasioned more than a passing interest among the 3,000 delegates who were in attendance, and a practical demonstration was also afforded by the 300 street cars in Denver which have been equipped with the new Buckeye tantalum lamps.

General Motors Company's Plans.

Supplementing the announcement from Trenton, N. J., that the General Motors Company had filed an amended certificate of incorporation, increasing its capital stock from $12,500,000 to $60,000,000, it was reported in trade circles that the company had under consideration the purchase of a number of leading plants. At the offices of the General Motors Company it was stated that it was too early as yet to give out any statement regarding the proposed plans of the company, although some announcement might be made later on.

In reply to a question on the subject an official states: "We have increased our common stock to $40,000,000 from $5,500,000, and the preferred from $7,000,000 seven per cent cumulative preferred to $20,000,000. We now control about twelve companies, all of which are doing a large business. Most of our companies are located in Michigan."

The General Motors Company, which was incorporated in New Jersey September, 1908, absorbed at that time the Rainer, at Saginaw, Mich.; the Olds Motor Works, at Lansing, Mich.; the Oakland plant at Pontiac, Mich., and the National and Reliance factories at Indianapolis, Ind. According to statements made recently, the production in 1909 will be 22,000 automobiles and the sales for the year will approximate $25,000,000. Under the proposed plans the producing capacity will be greatly enlarged.

General Electric Company Awards at Alaska-Yukon-Pacific Exposition.

The General Electric Company has received grand prizes (highest award) at the Alaska-Yukon-Pacific Exposition in each class of electrical apparatus in which an exhibit was made by the company. General Electric apparatus was ranked first in the following divisions:

Apparatus for cooking by electricity, apparatus for heating by electricity, automatic motor starters, arc lamps, rail bonds, cabinets, circuit-breakers, cut-outs, fans, indicating instruments, integrating instruments, insulated wires, insulated cables, incandescent lamps, mine locomotives, motor generators, motors for direct current, motors for alternating current, recording instruments, rectifiers (mercury arc), sockets, switches, transformers and wiring devices.

General Electric turbines were also entered in the government exhibit, in which no awards were made.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, SEPTEMBER 24.—It has been an open secret for some time past that the Underground Electric Railways Company of London was deposing the original Westinghouse turbines and was installing Parsons turbines in their place. One of these latter machines is now in place, driving a 6,000-kilowatt alternator.

A remarkable offer is being made by the Welsbach Incandescent Gas Mantle Company. The company is putting on the market a metal-filament lamp and offers to remove the whole of the carbon electric lamps from any existing installation and replace them with Welsbach filament electric lamps of at least equal candlepower, and will accept as settlement in full of its account the difference saved by the consumer in his electric current bill as ascertained by comparison with the corresponding quarter of last year. It is a sign of the times that a gas mantle company should see fit to put an electric lamp upon the market, although I believe the original metal-filament lamp patents were granted to Baron Welsbach.

There is no doubt that the trackless trolley system of electric traction is impressing itself more and more upon tramway managers in this country as time goes on. Despite the failure of any tramway authority to secure the necessary Parliamentary powers last session, the Leeds corporation intends to promote a bill in the coming session, and at the annual conference of the Municipal Tramways Association now being held in London many decided opinions in its favor are being expressed. The Railless Electric Traction Company has built a car which is experimentally running near London and a complete description will shortly be available. Among the more recent and prominent advocates of the system are the tramway managers of the London County Council and the Sheffield corporation, and there is every prospect of the system being largely adopted in the near future.

Another matter appertaining to tramways which has been discussed is the mode of collecting the current on trolley tramways; i. e., whether by rolling contact, as in the trolley arms, or by rubbing contact, as in the bow collector. With the exception of a small system close to London, viz., Sheerness, where a Siemens bow collector is employed, all our trolley tramways use the rolling contact, or trolley wheel, but the manager of the Sheffield corporation, in a paper on this subject, regards this as a most unmechanical device and is inclined to favor the use of the bow collector, although he has been unable to ascertain definitely whether this entails any further considerable wear upon the trolley wire. In general terms he has ascertained that the additional wear is not appreciable, but no definite figures appear to be available. Yet a further tramway question which has received discussion at the tramway conference is that of single-deck versus double-deck tram cars, but there continues to be a big difference of opinion on this point between British and American and continental tramway managers. Single-deck cars are only used here in very small numbers, and then when low bridges render their use imperative, but opinions are all against this type for ordinary use, it being argued that the current consumption of a double-deck car is very little more than that of a single-deck car, while the seating capacity is nearly double.

The Home Office will shortly appoint a committee to consider the regulations concerning the use of electricity in mines which were drafted in 1902, with the object of bringing them up to date and more in accord with the latest practice. That there is need for such an investigation is shown by the fact that as the result of an explosion in a Durham mine—which may or may not have been due to electrical causes—a resolution was recently put before the council of the Durham Mines Association urging coal owners to remove electrical machinery and cables from their pits. No action is to be taken, however, in view of the appointment of the committee referred to above, before whom a considerable volume of evidence will be placed.

An action is being taken by the Electrical Contractors' Association against the Aberdeen corporation for undertaking electric-wiring work which the association claims is illegal.

The Wireless Telegraph Act, which gives the state a monopoly, and which was renewed in 1906 for three years, is to be renewed for a further period of twelve months. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, SEPTEMBER 24.—One of the traction lines at Brussels, which runs from Gros-Tillene to Grimberghe, is being changed over to the electric system, and this work is now practically finished. The line will soon be opened for regular traffic. Electric traction is also to be adopted on one of the tramway lines of Vienna. The Union Bank, in which are deposited the Municipal Commission funds, is interested in the enterprise. A new section of standard-gauge railroad, belonging to the Austrian State lines, was opened for traffic not long since. The new section lies between the localities of Innerstadt and Fabriksstadt, and is now running regularly with electric trains. With a view of using electric traction on the Vintimille-Savona railroad line in north Italy, the government is considering a project for erecting a hydraulic plant of considerable size, which is to supply the current for this section. The new plant will probably be located at Vado and will thus lie near the railroad. Among the recent Spanish projects I note that the concession has been granted for a new system of tramway lines at Barcelona. At Epinac, France, there is being developed an extensive electric-light and power distribution, which will have this locality as a center and will operate a network of lines in the surrounding region. The principal promoters of the scheme are the Epinac Coal Mining Company, and measures are already being taken to carry on the erection work. A Paris electrical firm is engaged in an enterprise for an electric station to be erected at the town of St. Michel, for light and power supply.

The town of Cherbourg is to have a new electric-tramway system, and the work will be carried out by the Cherbourg Traction Company, seeing that sanction has been given by the Municipal Council. In the region of Belfort and Doubs there is to be installed a narrow-gauge electric-traction line, which will connect numerous localities. Oran, Algeria, is to have a tramway line, which is to run to El Ancos and various suburban points.

A syndicate of European banks, especially those of Antwerp and Brussels, is promoting an extensive metropolitan subway scheme for Buenos Aires. The project has recently been submitted to the government. Among the concerns which are interested in the affair are the Antwerp Bank and the Comptoir de la Bourse, of Brussels, also the Antwerp Electric Tramway and Electrical Enterprise Union and the Mutual Tramway Company of Brussels. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., OCTOBER 2.—The Shawinigan Water and Power Company, of Shawinigan Falls, Que., continues to make substantial gains in its earnings, the gross earnings for the past seven months being $447,780, against $448,959 last year.

The Enterprise Electric Company, of Warren, Ohio, is seeking a location in Ottawa for a Canadian branch of its plant. The company will manufacture electric supplies of all kinds.

The Temiskaming Telephone Company expects to have its new service in operation in Cobalt, Ont., within three months. Poles are being erected and arrangements are being made for the work of installing the system later.

A contract was signed at Montreal this week by the Mexican Northern Light and Power Company with the well-known English contracting firm of Sir Whitman Pearson & Sons for the construction of a dam-power plant and twenty miles of railway on the Conchos River. The contract price covers about $5,000,000 and the work is to be completed in three years.

The fiscal year of the Montreal Street Railway ended on the 30th of September, and it is estimated that the gross earnings of the system for the year will show upward of $3,860,000. This is the largest year in the history of the company, and it is believed that the company will show around eleven-and-three-fourths to twelve per cent on the stock.

It is stated that the Quebec Street Railway stock will be taken up at $75 a share if the present plans of those who are negotiating with a view of bringing about a merger of the light and railway companies of that city are successfully carried out. It is understood that the light companies at Quebec are cutting rates to a price at which there is a minimum of profit.

A report is current that the Ottawa Light, Heat and Power Company will shortly increase its dividend from five to six per cent. This company is the holding concern for the Ottawa Electric and Ottawa Gas companies. Application has been made to list $1,600,000 on the Montreal Stock Exchange from the two millions outstanding common stock of the new company. The stock has never been on the open market.

At the annual meeting of the American Peat Society, held at Boston, Mass., last week, Dr. Eugene Haanel, of Ottawa, director of mines for Canada, was elected president for the

ensuing year. This distinction for a Canadian and by a society which embraces in its membership the leading geologists and mineralogists of the United States is in recognition of Dr. Haanel's work in paving the way for the development of the metallic mineral resources of Canada by means of electric smelting.

Power from the hydroelectric commission of Ontario will be delivered in the city of Toronto next March. The city would have been able to receive it much earlier but for the delay in selecting a site for the transformer station. Four other of the municipalities will receive power from the commission in March. The transmission line from Niagara Falls will be ready before any of the municipalities have their stations completed.

The Mexican Northern Power Company, a Canadian concern recently incorporated with a capital of $10,000,000, intends to develop electrical power in the northern part of the Mexican Republic. The company possesses valuable concessions from the federal government of Mexico as well as the state government. These concessions constitute a practical monopoly for the development of electric power in northern Mexico. The company intends to supply ten or twelve towns with electric power and light, and furnish power to a large number of mining districts situated around Chihuahua, the capital of the state. The company will have 210 miles of transmission lines and will develop about 50,000 horsepower. The directors of the company are: G. F. Greenwood, Montreal, president; E. B. Greenshields, Montreal, vice-president; Edwin Harrison, S. M. Brookfield, Halifax, N. S.; B. F. Pearson, J. D. Patterson, Woodstock, Ont., and Paul Githner, Mexico. W.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

EXTENSIVE ELECTRIC RAILWAY DEVELOPMENT PLANNED—Announcement has been made at Bloomsburg, Pa., by E. R. Sponsler, of Harrisburg, president of the Columbia Power, Light and Railways Company, a $1,500,000 corporation, which recently absorbed the Columbia & Montour and Danville & Bloomsburg Electric railways and the six electric and gas-lighting plants in Columbia and Montour counties, that in the near future work will be started to extend the lines of the Columbia & Montour from Berwick to Wilkesbarre, thirty-two miles, and the Danville & Bloomsburg from Danville to Sunbury, fourteen miles, with the possibility of making further extensions to Shamokin and then throughout the West Branch, giving the holding company control of upward of eighty miles of railway. It is authoritatively stated that the present $1,500,000 corporation is only the beginning of the absorbing and consolidating of electric plants in Central Pennsylvania and that eventually the Columbia Power, Light and Railways Company, whose main offices are at Bloomsburg, will be at least a $5,000,000 corporation.

SAN FRANCISCO LIGHTING AND POWER CONTRACTS—Seven contracts between the United Railroads of San Francisco, its allied corporations, the Knickerbocker Trust Company, of New York, and the United States Mortgage and Trust Company, of New York, were filed in this city last week. The first of these papers was a contract for the purchase by the railroad company from the Sierra and San Francisco Power Company of 122,120,000 kilowatt-hours of power annually at seven-and-one-half mills per kilowatt-hour, or a total yearly payment of $975,200. Other agreements provided for the leasing by the power company of the United Railroads power houses on Bryant Street and North Beach, in this city, and for the purchase of power by the United Railroads from these on the basis of eight mills per kilowatt-hour. Two mortgages covering all of the property of the Sierra and San Francisco Power Company, in favor of the United States Mortgage and Trust Company, were also filed. The first mortgage provided for a bond issue of $14,000,000, with a possible increase to $30,000,000, and the second mortgage provided for a possible bond issue of $6,000,000. The bonds are to be dated from August 1, 1909, and to run forty years. Among the rights and properties catalogued in the mortgages are: Rights to 23,000 miner's inches of water from the Middle Fork of the Stanislaus River, to 50,000 inches in Relief Creek Fork and 100,000 inches of flood waters in the latter. The other documents filed set forth the transfer of the properties of the Stanislaus Electric Power Company, the Stanislaus River Water Company, the Union Construction Company and the Tuolumne Water Power Company to the Sierra and San Francisco Power Company, which were effected some months ago.

LIGHTING AND POWER.

(Special Correspondence.)

MANDEVILLE, LA.—The City Council has granted an electric-light franchise to S. Pigagio.

ARDMORE, OKLA.—Judge J. T. Dickerson is reported to ask this city for an electric-light franchise.

ATLANTA, ILL.—The Atlanta Electric Light, Heat and Power Company is building a high tension line to McLean, a distance of five-and-one-half miles. This plant was formerly operated upon a voltage of 220 and will install an alternator to care for the increased load. V.

FERGUS FALLS, MINN. The City Council will call for bids for installing the new system of lights.

ERICK, OKLA.—This city has voted bonds to the amount of $10,000 for installing of electric-light plant.

CLINTON, LA.—This city will vote September 21 on issuing $15,000 in bonds for an electric-light plant.

LOS ANGELES, CAL.—The Board of Public Works is advertising for bids for 10,400 feet of copper cable.

ELGIN, TEX.—This city is considering the construction of an electric-light plant. W. H. Kennedy is mayor.

AZTEC, N. M.—The Aztec Light and Power Company has been incorporated, with a capital stock of $20,000.

EL RENO, OKLA.—H. M. Byllesby & Co., of Chicago, have purchased the property of the El Reno Gas and Electric Company.

WESTVILLE, OKLA.—The Westville Electric Light and Power Company has been incorporated, with a capital stock of $10,000.

GRAND FORKS, N. D.—The Electric Construction Company, of St. Paul, has decided to proceed with the installation of the lighting system. C.

DAVENPORT, IOWA—A vote will be taken October 15 by the Town Council of Bettendorf on granting a franchise for an electric-light plant. C.

WATERTOWN, S. D.—An ordinance has been introduced into the Council granting a franchise to Ferris Brothers to operate an electric-light plant. C.

VIRGINIA, MINN.—The Virginia Electric Power and Water Company will shortly commence the erection of an office building at a cost of $12,000. C.

PORTLAND, ORE.—The Gibson Manufacturing Company will build a power plant on the Clackamas River to develop power for manufacturing purposes.

WELLS, NEV.—The Pacific Reclamation Company will establish a power plant on Bishop Creek and convey the current to Wells for light and power. U.

AURORA, MINN.—The Hartley Electric Company, of Virginia, Minn., has petitioned the Council for a twenty-year franchise to operate an electric-light plant. C.

PETERSBURG, ILL.—The Petersburg Electric Light Company is building a high-tension line north to Greenview and Mason City, a distance of sixteen miles. V.

FORT LINCOLN, VIA BISMARCK, N. D.—J. D. Elliott, constructing quartermaster, will receive bids in triplicate until October 19, for wiring buildings at Fort Lincoln. C.

SAN FRANCISCO, CAL.—The Oro Water, Light and Power Company has filed amended articles of incorporation, increasing the number of directors from five to seven.

ABERDEEN, WASH.—The town of Cosmopolis has granted a franchise to the Grays Harbor Railway and Light Company to install an electric-lighting system in that city.

IOWA FALLS, IA.—This city is to vote on giving a 25-year electric-light franchise to the Interstate Power Company; if granted, the company will expend about $500,000.

POINT RICHMOND, CAL.—The Richmond Light and Power Company has arranged to establish a reinforced concrete substation at Second and Nevin streets to cost about $8,000.

CHIHUAHUA, TEX.—Plans have been completed by the Nazas River Power Company to build a hydroelectric power plant in Fernandez Canyon on the Nazas River, in Durango.

RATON, N. M.—The French Town Company, of French, near this place, has been granted a franchise for an electric transmission system for light and power purposes in that place.

LOS ANGELES, CAL.—Work has been started on the installation of a power plant for the irrigation of orange lands on the Armstrong tract in San Bernardino and Riverside counties.

SNOHOMISH, WASH.—The Snohomish Electric Company is remodeling its power station with a view to increasing the voltage from 30,000 to 60,000 volts. Two large transformers will be installed. C.

ELK CITY, IDAHO—J. D. Wooden, from the Buffalo Hump camp, reports that machinery will be installed for treating the ore and that a waterpower plant will be installed for operating the mill. U.

SACRAMENTO, CAL.—The California State Engineer, with offices at this place, is advertising for bids for the construction of a power house at the California Polytechnic School, at San Luis Obispo.

PORTAGE, WIS.—The Southern Wisconsin Power Company has commenced work on the erection of a substation, which will be two stories, 65x35 and 40 feet high, of brick construction, with concrete floors. C.

LOS ANGELES, CAL.—The Chapal Hydro-Electric and Irrigation Company has negotiated for a loan of $2,200,000 needed for the completion of the new power plant at Puente Grande, on the Santiago River.

PIERRE, S. D.—The City Council has closed a contract for a 150-horsepower engine and dynamo for the lighting plant at a cost, including a 250-horsepower engine and pump for the waterworks, of $20,500. C.

CARTER, MONT.—The Iron Mask Mining Company near here is preparing to install a concentrating plant at this place. The company will also install a compressor plant and other machinery to drive a tunnel. U.

BATAVIA, N. Y.—The Genesee Light and Power Company has been incorporated, with a capital of $250,000, by W. C. Lewis, Boston, Mass.; F. W. Keller, New York city and A. Ludeke, Hoboken, N. J.

OELWEIN, IOWA—The Oelwein Light, Heat and Power Company is making extensive improvements at its plant. A 100-foot smokestack and a brick building, 110x100x80, with new engines and dynamos, will be installed.

DETROIT, MINN.—Bids for the extension and improvement of the light and power, waterworks and heating plants, from plans by L. P. Wolff, engineer, St. Paul, Minn., were rejected and new bids will be taken later. C.

WENATCHEE, WASH.—Frank McKean, general manager of the Ranier Power and Irrigation Company, of Seattle, has secured control of power plants along the Columbia River, from which 45,000 horsepower will be developed.

LOS ANGELES, CAL.—The Board of Public Works has recommended to the City Council that bonds to the amount of $3,500,000 be issued for the development and distribution of electric power along the Los Angeles aqueduct.

MACHIAS, ME.—The Eastport Electric Light Plant, which has had a history, and entered into the hands of a receiver, it is reported, was sold to Dr. Stephen A. Welch, of Providence, R. I., on September 1. A. W. Morey, Jr., will be in charge.

LOGANSPORT, IND.—State Geologist W. S. Blatchely, who is making a survey of the rivers of the state, with a view of determining their power sites and facilities, is at present engaged in making a few days' survey of the Eel and Mississihewa rivers.

CARSON CITY, NEV.—The State Board of Commissioners for the Insane, Carson City, Nev., will receive bids up to October 11 for furnishing pole lines, waterwheels, generators, exciters, switchboards, power-house equipment, pump, motors, wells and pipe lines. U.

BUTLER, N. J.—The Butler Electric Light and Power Company has been incorporated to operate electric-light and power works, with a capital of $50,000. The incorporators are: E. O. Jones, Rutherford, N. J.; J. B. Lydecker, Bloomingdale, N. J.; H. R. Schneider, Westwood, N. J.

KINGMAN, ARIZ.—The Desert Power and Water Company has started up its plant. From now on power will be transmitted to Goldroad, where about 200 horsepower will be taken off by the Gold Road M. & E. Company for use in running hoists, compressors and other machinery. The Gold Road Company has its hoists and compressors installed and is prepared to handle the juice. The completion of this great plant marks a new era in mining in this county. Heretofore power cost the Gold Road company from $26 to $43 per horsepower per month, while the new and better power will cost but $11.50 per horsepower per month.

LOS ANGELES, CAL.—The Kern River power plant No. 1 of the Edison Electric Company resumed operations last week after being shut down for eight months. The plant, which has a capacity of 35,000 horsepower, was completed about two years ago, but, after it had been in operation a year, a break was discovered in the main pressure pipe. The plant was shut down and the company's auxiliary steam plants put in operation in its stead. Under the supervision of W. A. Brackenridge an entirely new pipe of heavy steel was inserted in the old pipe, to which it was cemented. This has a total length of 1,300 feet.

SANTA ANA, CAL.—The articles of the Southern California Edison Company, filed here with capital stock of $30,000,000, of which $9,000 has been actually subscribed, show the following directors: S. M. Kennedy, of Alhambra, O. P. Schoonmaker, J. A. Lighthipe, E. W. Sax, A A. Maxwell, William Dieterle, A. E. Morphy, John Otto, all of Los Angeles, and F. W. Balfour, of Pomona. The thirty-million-dollar capital stock is divided into 300,000 shares of the par value of $100 each. Four millions of this is preferred stock and twenty-six millions common stock. The principal place of business will be at Chino, San Bernardino County.

ELECTRIC RAILWAYS.

(Special Correspondence.)

CENTERVILLE, IOWA—Work has been started on the grading for the Centerville-Mystic interurban line. C.

WATERLOO, IOWA—The Waterloo, Cedar Falls & Northern Railway Company has decided to increase its capital stock to $2,250,000. C.

BRECKENRIDGE, MINN. — The Wahpeton-Breckenridge Street Railway Company, D. J. Jones, secretary, has been incorporated, with a capital of $50,000. C.

BILLINGS, MONT.—A company composed of J. B. Arnold, H. W. Rowley and others has been organized for the construction of an electric road to Laurel. C.

LOS ANGELES, CAL.—The Board of Supervisors is advertising for bids for the West Adams Street electric railway, a franchise for which was recently obtained.

MINNEAPOLIS, MINN.—The Electric Short Line has been purchasing land with a view to constructing a line to Medicine Lake, and ultimately to Watertown and Rockford. C.

SIOUX CITY, IOWA—It has been definitely decided that the route of the Sioux City & Spirit Lake road will be through Granville instead of through Paullina and Germantown. C.

BLOOMINGTON, ILL.—Cars will be running on the interurban from Lexington to Chenoa by the first of the year, according to the information given out by the company. V.

DECATUR, IND.—The Fort Wayne & Springfield Traction Company has begun the work of extending its line from Decatur to Berne and will ultimately extend the line to Portland. S.

COLUSA, CAL.—The City Trustees have passed an ordinance granting to the Northern Electric Railway Company the right to construct and maintain a double-track railroad of standard gauge along the streets of Colusa, for fifty years.

INDIANAPOLIS, IND.—The earnings of the Indianapolis & Crawfordsville Traction Company are increasing under the management of H. J. Milligan, receiver for the company. The total earnings for August were $18,910.41, against $12,809.17 for July. S.

BOSTON, MASS.—The Middlesex & Boston Street Railway has petitioned the Railroad Commissioners for the privilege of issuing $200,000 additional capital stock for the purpose of perfecting the consolidation with the Newton & Boston Street Railway Company.

NEW CASTLE, IND.—Track laying is progressing rapidly on the Indianapolis, New Castle & Toledo traction line. About 400 men are at work on the road, car barns and a shop are being erected here, cars have been purchased and the power house is almost completed. S.

NEW YORK, N. Y.—It is announced that the New York, Westchester & Boston Railway has purchased almost all the right-of-way needed for its White Plains branch, at prices ranging from $3,000 to $6,000 an acre. It is estimated that the entire line will cost upward of $1,000,000.

SALT LAKE, UTAH—It is announced here that the work of electrifying the eighteen-mile road from Salt Lake City to Saltair, on Great Salt Lake, will be started early this fall. It is reliably reported that the Oregon Short Line, representing E. H. Harriman's interests, now own the line. U.

POMONA, CAL.—According to a report circulated today, prominent business men here have become interested in a project to build an electric line from Pomona to Claremont, the seat of Pomona College, and on to Indian Hill, a distance of about five miles. Surveys have already been made.

TELL CITY, IND.—Articles of incorporation have been filed in the office of the secretary of state for the Tippecanoe & Monticello Interurban Railway Company, capitalized at $100,000, with the purpose of constructing an electric railway connecting Fowler and Logansport and intervening points.

INDIANAPOLIS, IND.—H. J. Milligan, receiver for the Indianapolis, Crawfordsville & Western Traction Company, has purchased ten new motor cars from the Westinghouse Electric Manufacturing Company, subject to the approval of the court. The road is greatly in need of additional equipment. S.

HAMMOND, IND.—The Western Indiana Construction Company has incorporated, with a capital stock of $100,000. The company proposes to make a specialty of constructing interurban railroads and telephone plants and equipping the same. Allen T. Russell, F. M. Zimmerman and T. W. Potts are the directors. S.

ROCKPORT, IND.—It is reported that the officials of the Rockport Traction Company entered into a contract during the past week with C. H. Battin, superintendent of the Tennis Construction Company, of Pittsburg, Pa., for building an extension of the road from this city to Troy, Tell City and Cannelton. Hammond township has voted a two-per-cent tax in aid of the con-

struction of the road. Ultimately the road will be extended to Louisville, affording trolley service between Louisville and Evansville. S.

WILMINGTON, DEL.—An extension beyond Brandywine Springs Park to Marshallton is being made by the People's Railway. The extension will be operated within a month. Cars will run over the Springs line, and over the West Chester and Kennett Square line a short distance, leaving it by way of the Wilmington Hard Fibre plant to Marshallton.

VANCOUVER, WASH.—Articles of incorporation of the Tum Tum Mountain Railway Company, of Vancouver, have been filed with the state auditor at Olympia. The object of the corporation is to build and operate a railway in Clark County from Tum Tum Mountain, northeast of Yacolt, through Chelatchie Prairie, Amboy, View and La Center, to Ridgefield, on Lake River.

OTTAWA, ILL.—Ottawa and Streator will exchange Christmas greetings over the new interurban railway now under construction between the two cities if the calculations of the engineers and managers prove correct. The work between Ottawa and Grand Ridge is being rushed, and the work that is being done strikes the observers as being of a high grade.

PEORIA, ILL.—The grade for the Bloomington, Pontiac & Joliet Railway Company's line between Pontiac and Chenoa is about completed and ready for the rails. This is the line that is owned by the Fishers of Joliet and they now have a line in operation from Pontiac to Joliet, and this will make a southern extension from Pontiac, and will finally end at Bloomington. V.

WARSAW, IND.—Subsidy elections in aid of the construction of the Wabash & Northern Electric Railroad from Wabash to Warsaw have been ordered for October 11 in Clay and Lake townships. The town and city people are favoring the tax, while the farmers will oppose it on the ground that another company stands ready to build the road without the aid of a subsidy tax. S.

INDIANAPOLIS, IND.—The Indiana Railroad Commission has furnished the attorney-general with complaints and evidence of the violation of the sixteen-hour law by a number of interurban roads and directed that they be prosecuted. The law prohibits railroad companies from working their employes more than sixteen consecutive hours under penalty of from $100 to $500 fine. S.

DELPHI, IND.—The Delphi, Flora & Burlington Traction Company has filed articles of incorporation, with a capital of $125,000. The company proposes to construct and operate street and interurban lines in and connecting the above-named towns and cities. The line will be twenty-six miles long. E. W. Bowen, J. C. Smock, Wm. Dolin, F. S. Blythe and H. G. Haun, directors. S.

FRESNO, CAL.—A. G. Wishon, general manager of the Fresno Traction Company, announces that within the next few months the company will expend $60,000 on new equipment and $25,000 on a new car barn. The new equipment includes ten new forty-foot pay-as-you-enter cars, with a seating capacity of forty-six people each. The new car barn will have a capacity for forty-four cars.

NAPERVILLE, KY.—The Kentucky Rapid Transit Company, capitalized at $10,000,000, has been chartered at Dover, Del., to take over traction companies in Kentucky. Its principal operations at first will be Louisville, Lexington and Frankfort. The company is said to have been organized by Boston, New York and Philadelphia capitalists. It is also authorized to operate electric-light and gas plants.

OLYMPIA, WASH.—Vigorous protest has been filed with the Tax Commission by Stone & Webster against the levy on lines of the Puget Sound Electric Company, controlling the Tacoma-Seattle interurban line and the Tacoma Railway and Power Company. Company officials say a double assessment has been made on stocks and bonds, listed against the T. R. & P. Company and the Puget Sound company.

TOLEDO, OHIO—The unusually large number of accidents on the interurban lines of Ohio this summer is said to be responsible for the action of the State Railroad Commission, in calling into conference the operating officials of these lines, at the hearing room in Columbus, Tuesday, September 28. It was hoped that some plan might be evolved for furnishing better protection to the traveling public.

SOUTH BEND, IND.—Inspector Shane made a report to the Indiana Railroad Commission to the effect that the Chicago & South Bend interurban line has put into effect the recommendations made by the commissioners following the investigation of the wreck at Chesterton, in which twelve people were killed. The recommendations included a change in the entire management and a greatly improved method of operation. S.

HELENA, MONT.—E. C. Horner announces the letting of the contract for the building of an interurban line between Helena and West Helena, the new manufacturing suburb of Helena. The contract has been let to R. L. Leonard. The motive power is to be electricity, and the cost of the road is to be about $40,000, besides the cost of erection of a modern electric plant, which will be installed in West Helena. Work will be started immediately.

ANITA, IOWA—New impetus to the building of an interurban from Des Moines to Adel, in Dallas County, has been given by the organization of the Adel City Railway Company, with a capital stock of $10,000. The articles of incorporation for the new company show the incorporators to be Dan A. Blanchard, L. M. Macy, W. B. Kinnick, Robert Pilmer, F. F. Flynn, B. J. Flynn, R. L. Parrish and H. A. Smith, all of whom are deeply interested in the proposed Des Moines-Adel interurban.

NEW ALBANY, IND.—A franchise has been granted by the Board of Orange County Commissioners to Jacob H. Fawcett and Charles D. Kelso, of New Albany, authorizing the construction of an interurban railroad over the Paoli and New Albany Turnpike. It is provided that the company shall complete and have in operation its line of railroad from the city of New Albany to the town of Paoli by December 15, 1910. It is also proposed to secure a private right-of-way for the road from Paoli to French Lick.

COLUMBUS, IND.—The first case on record where a balloon put a railroad out of commission happened to the Indianapolis, Columbus & Southern Traction Company October 1. A balloon sent up from Indianapolis collided with the high-tension wires of the company near Edinburg and did considerable damage to the lines and power plant. Traction companies have had tilts with about everything, but this is the first case on record where a balloon has put a railroad out of commission. It was lucky that the occupants had no ground connection, because the wire which their anchor struck carries five thousand volts of electricity, and if there had been a ground connection it would have been instant death to the two men, who threw out ballast and sailed on. S.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

BIG TIMBER, MONT.—Paul Van Cleve, of Melville, will extend his telephone line to Harlowton.

MEXIA, TEX.—The Mexia Telephone Company has been incorporated, with a capital stock of $12,500.

COLEMAN, TEX.—The West Texas Telephone Company is about to expend $16,000 on improvements.

AMARILLO, TEX.—The Oldham Telephone and Telegraph Company will extend its lines out of this city.

WHITE EARTH, MINN.—The White Earth Telephone Company will extend its line to Waubun and Ogema.

GREAT FALLS, MONT.—The Rocky Mountain Bell Telephone Company will reconstruct its toll line to Helena. C.

FAYETTEVILLE, ARK.—The Oxford Telephone Manufacturing Company has begun manufacturing telephone boxes, etc.

NORTHFIELD, MINN.—The Northfield Telephone Company is asking for a franchise, and the vote will be taken September 28.

OROVILLE, CAL.—Work has been started by the Pacific Telegraph and Telephone Company in rebuilding its Oroville system.

WARSAW, IND.—The Commercial Telephone Company has decided to build a No. 10 copper toll line from Warsaw to Wabash. S.

LIGONIER, IND.—The Ligonier Telephone Company will soon begin the work of building a new toll line from Ligonier through Goshen to Warsaw. S.

PETALUMA, CAL.—The Lakeville Telephone Company has awarded a contract to W. D. Thomas to build the new telephone line in the Lakeville district.

SANTA ROSA, CAL.—H. C. Eastman has asked the Board of Supervisors for a franchise to erect and maintain telegraph and telephone lines along certain public roads of the county.

DECATUR, IND.—The Citizens' Telephone Company has declared a dividend of six per cent, to be paid to its stockholders. The directors also planned to make some improvements in the plant. S.

DES MOINES, IOWA—The Hawkeye Telephone Company has been incorporated by officers of the Iowa Telephone Company, with a capital of $100,000, to handle the toll business that was formerly done by the Mutual Telephone Company. C.

VALPARAISO, IND.—The officials of the Northwestern Indiana Telephone Company have notified the Secretary of State that the capital stock has been increased from $100,000 to $150,000. The company will extend the lines and add some new equipment. John H. McGill is president. S.

LINCOLN, NEB.—According to the monthly report to the Council the August gross receipts of the Lincoln Telephone and Telegraph Company were $13,882.81. The total receipts from rentals of telephones connected with the Lincoln exchange was $12,596.58, from which deductions are made for rentals for tele-

phones outside of the city and those used by the state, as well as for "no service" claims, leaving $12,167.81 subject to occupation tax. The total revenue upon which an occupation tax is assessable is $13,882.81, and the tax is $277.65.

WASHINGTON, D. C.—The Southern Bell Telephone and Telegraph Company is constructing three lines of telephone wires in West Virginia. Two of these lines run to Huntington from the Boone oil field and Griffithsville oil field, respectively, and the third line is along the Virginia Railway.

RENSSELAER, IND.—At the annual meeting of the directors of the Home Telephone Company the following officers were elected: President, R. T. Yeoman; vice-president, F. K. Wilsh; treasurer, M. I. Adams, and secretary, E. F. Babcock. The directors made plans to improve the system. S.

TOLEDO, OHIO—The Western Ohio Railway has completed details of an issue of bonds amounting to $360,000, drawing six per cent interest, to take up the floating indebtedness of the road. The notes are secured by $500,000 of the company's first-mortgage bonds. It is said that Cleveland banks took the entire issue. H.

SPICELAND, ILL.—The stockholders of the Spiceland Telephone Company have notified the Secretary of State that the capital stock of the company has been increased from $10,000 to $20,000. The proceeds of the additional stock sale will be used in modernizing the plant, adding new equipment and extending the lines. S.

AURORA, ILL.—It is stated in financial circles that the board of directors of the Interstate Telephone and Telegraph Company has decided on an expenditure of $5,000,000, to be spent in yearly installments of $1,000,000, for improvements of present service, extensions of lines and in the purchase of new general equipment.

PORTLAND, IND.—The Home Telephone Company has purchased the Bell Telephone Company's exchange and wires in Jay County and will combine the two systems. The surrender of the Portland field to the Home company increases its subscribers about 1,500. The plant will be rebuilt and considerable underground cable laid. S.

ALBANY, N. Y.—The Hudson Valley Telegraph Company, of New York, has been incorporated to operate telegraph and telephone lines through this state, northward to Canada and through the eastern states, Pennsylvania and New Jersey. The directors include: James M. Ryan, P. F. Crowe, Edward J. Kelly, all of New York. The capital is $25,000.

CRAWFORDSVILLE, IND.—The Covington & Southwestern Traction Company has filed a mortgage with the recorder of Montgomery County for $825,000, in favor of the Union Trust Company, of Indianapolis. The proceeds will be expended in the construction of a traction road from Covington to Crawfordsville. The work is progressing rapidly. S.

LA CROSSE, WIS.—Through an offer to purchase the system of the La Crosse Telephone Company the Wisconsin Telephone Company has prospects of removing the only serious competition in the western part of the state. The local company doubled its capitalization last week, it now being $200,000, and the stockholders have been offered par for their holdings.

INDIANAPOLIS, IND.—The Indianapolis Telephone Company is expending $100,000 in improving and extending its plant. This includes new exchange buildings, automatic switches, underground and aerial construction, principally on the north and west side of the city. The company has nearly 16,000 subscribers and is making new contracts at the rate of 450 per month. S.

INDIANAPOLIS, IND.—The court has entered an order authorizing the issuance of $460,000 in receiver's certificates for the completion of the Indianapolis, New Castle & Toledo traction line. The Union Trust Company, receiver, will now let contracts for the speedy completion of the road. The electrical equipment will be reinstalled in the powerhouse at New Castle and the power plant finished. Ties are now being distributed along the line. S.

TOLEDO, OHIO—The Ohio Electric Company will build a new union interurban depot at Lima, Ohio, the work to be started at once. A suitable site has already been secured and bids received for the building, which will cost about $50,000. It will be modern and complete in every detail, two stories in height and built of cement and brick. The upper story will be devoted to the traffic department offices. The structure is to be completed within one year. H.

MITCHELL, S. D.—The annual meeting of the Dakota Central Telephone Company was held at Aberdeen a few days ago, and its officers made a very satisfactory report of the past year's achievements. The officers were authorized to expend $300,000 for the coming year in making improvements and enlarging the service. The stockholders showed their faith in the enterprise by at once subscribing for an issue of $250,000 in new stock. Much new copper wire will be stretched the coming year and several exchanges on the company's lines enlarged.

ELECTRICAL SECURITIES.

The call for money to move the crops, although anticipated, has had the usual effect on the security market. The rate set at six per cent was expected, yet produced considerable liquidation among the active securities. There is nothing, however, in the present situation in the least bit unusual, other than a decidedly confident feeling in regard to business generally. Money is tight, but that is a normal condition at this season of the year.

Traffic on the Metropolitan Elevated during September ran eleven to thirteen per cent over that of last year.

The New York Public Service Commission has approved the application of the Nassau Electric Railway Company for authority to issue $730,000 bonds to refund the same amount of bonds expiring October 1.

The $2,000,000 Oregon Electric Railway first-mortgage five-per-cent bonds which N. W. Harris & Company and Moffat & White offered, were sold within a few hours after the offering was made. The bonds are secured by first mortgage on the entire property of the company, which cost more than $3,000,000.

The gross receipts from passenger traffic by the Philadelphia Rapid Transit Company in September amounted to $1,610,510, comparing with $1,494,605 in September, 1908. The receipts for the first three months of the current fiscal year ended September 30, amounted to $4,835,633, comparing with $4,495,182 in the first quarter of the previous year.

For the first time since the organization of the Massachusetts Electric Companies, ten years ago, that company and all its subsidiary companies are now free from floating debt, the last note having been paid off within a few days, and the companies have $1,200,000 cash in the bank.

The Westinghouse Electric and Manufacturing Company has declared a quarterly dividend of one-and-three-fourths per cent on the preferred stock and three-and-one-half per cent accumulated dividends. This restores the stock to the seven-per-cent-per-annum basis and leaves nine per cent still due on the accumulated dividends on the preferred stock. The dividends are payable October 15 to stock of record October 9. Books close October 9 and reopen October 16.

NEW YORK.

	Oct. 4.	Sept. 27.
Allis-Chalmers common	15⅝	15
Allis-Chalmers preferred	54¼	52½
Amalgamated Copper	84	83
American Tel. & Cable	*80	80
American Tel. & Tel.	142¼	143⅞
Brooklyn Rapid Transit	80½	79⅞
General Electric	167	166
Interborough-Metropolitan common	16½	14¾
Interborough-Metropolitan preferred	50¼	47¾
Kings County Electric	135	131
Mackay Companies (Postal Telegraph and Cables) common	93¼	92½
Mackay Companies (Postal Telegraph and Cables) preferred	75½	76¾
Manhattan Elevated	142	142¾
Metropolitan Street Railway	20	20
New York & New Jersey Telephone	139	139
U. S. Steel common	92⅞	84¾
U. S. Steel preferred	130¼	128¼
Western Union	78¾	79½
Westinghouse common	87¼	86
Westinghouse preferred	140	133

*Last price quoted.

BOSTON.

	Oct. 4.	Sept. 27.
American Tel. & Tel.	142¼	143⅜
Edison Elec. Illuminating	....	252
General Electric	167	166
Massachusetts Electric common	18¼	15⅞
Massachusetts Electric preferred	81½	79
New England Telephone	....	138½
Western Tel. & Tel. common	10½	11½
Western Tel. & Tel. preferred	....	89

PHILADELPHIA.

	Oct. 4.	Sept. 27.
American Railways	45¾	46
Electric Company of America	12⅛	12
Electric Storage Battery common	60¾	59
Electric Storage Battery preferred	60¾	59
Philadelphia Electric	12½	12¾
Philadelphia Rapid Transit	29	27½
Philadelphia Traction	90	90
Union Traction	53½	53

CHICAGO.

	Oct. 4.	Sept. 27.
Chicago Railways, Series 1	108	108
Chicago Railways, Series 2	36	36
Chicago Subway	7¼	9
Chicago Telephone	138	136¼
Commonwealth Edison	120	120½
Metropolitan Elevated common	15	15
Metropolitan Elevated preferred	51	51
National Carbon common	97	95
National Carbon preferred	118	118¾

PERSONAL MENTION.

C. O. FRISBIE has been elected president of the Illinois Tunnel Company, succeeding Samuel McRoberts.

CYRUS O. BAKER returned from an extended trip through Europe recently, accompanied by Mrs. Baker. While abroad Mr. Baker was quite ill for several weeks, but a prolonged visit at one of the German springs benefited his health. Mr. Baker, who

is known to the electrical fraternity as "the platinum king," will at once resume active duties in this field, and also in the financial and banking circles, in which he is largely interested.

P. F. SULLIVAN, president of the subsidiary companies and general manager of the Massachusetts Electric Companies, has sailed for Europe for a month's vacation.

A. W. LEWIN was advanced on September 1 to the position of manager of the New Orleans office of the Sprague Electric Company. Mr. Lewin has been connected with the office for some time. He is a member of the American Institute of Electrical Engineers, and has had extensive commercial and engineering experience in the electrical business in both North and South America. This experience, combined with his command of the various languages spoken in his territory, should portend a successful career in his new position.

ARTHUR H. BOETTCHER has joined the staff of Brown & Williams, patent attorneys and counselors, 1550 Monadnock Block, Chicago. Mr. Boettcher is a graduate of the Chicago-Kent College of Law and has been admitted to practice in the State and Federal courts. His engineering education at Lewis Institute and the University of Wisconsin, together with six years of experience in practical work before the United States Patent Office, especially qualify him to conduct the prosecution of patent applications and proceedings incident thereto.

WILLIAM A. BRACKENRIDGE left Niagara Falls on Friday, October 8, for Los Angeles, Cal., to become vice-president of the Southern California Edison Company. Mr. Brackenridge has been a member of the Canal Board of New York state. During his many years of residence at Niagara Falls Mr. Brackenridge has endeared himself not only to residents, but to the many visitors who have viewed the power development. Engineering bodies will recall his courtesy when they were at Niagara and extend to him best wishes in his new home. E.

EDWARD C. BROWN, who is manager for the Dearborn Drug and Chemical Works in the Hawaiian Islands and the Orient, has been elected president of the Commercial Club of Honolulu. This club is similar to the chamber of commerce and association of commerce organizations in the large cities of the states. This is an honor highly esteemed, and is an evidence of the high standing of the Dearborn company's representative in the Hawaiian Islands. Mr. and Mrs. Brown recently made a trip in the interests of the Dearborn company to the Orient, spending several months in China, Japan, Korea, and the Philippines.

OBITUARY.

EDWARD G. COCHRANE, formerly general superintendent of the Postal Telegraph Company, stationed at New York city, died last week at his residence in Manchester, Vt. He had been afflicted with paralysis for a long time. Mr. Cochrane was fifty-six years old. He leaves a son, Dr. F. L. Cochrane, of Brooklyn, and a daughter, Mrs. E. B. McLean, Hoosic Falls, N. Y.

MARTIN J. WULSTEIN, district superintendent of the Brooklyn Rapid Transit Company's surface lines, died from paralysis at his home in Brooklyn on October 2. He was thirty-six years old. Within twelve years, the time of his service with the Brooklyn Rapid Transit lines, he held different positions, beginning with that of conductor. He was made district superintendent three years ago.

STEPHEN HANLEY, formerly connected with the Interborough Railway Company, and father of Deputy Tax Commissioner Stephen J. Hanley, died of kidney trouble at his home, 1408 Madison Avenue, Wednesday, September 30. He was sixty-five years old, and had been an invalid for five years. He was a member of the Tammany Hall General Committee of the Twenty-sixth Assembly District. He is survived by his widow, one son and one daughter.

PROPOSALS.

POST OFFICE, LEAD, S. D.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until October 26 for the construction, complete, of the United States Post Office at Lead, S. D., in accordance with drawings and specifications, copies of which may be had at the office of the postmaster at Lead, S. D., or at the Supervising Architect's office.

ELEVATORS—Sealed proposals, endorsed "Proposals for Elevators," will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until October 16 for installing two electric passenger elevators at the United States Naval Medical School Hospital, Washington, D. C. Plans and specifications can be obtained on application to the bureau. Wm. M. Smith, acting chief of bureau.

POST OFFICE, COLUMBUS, MISS.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until October 22 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at Columbus, Miss., in accordance with drawings and specifications, copies of which may be had from the custodian of site at Columbus, Miss., or at the Supervising Architect's office.

POST OFFICE, HOBOKEN, N. J.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until October 21 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of an extension, remodeling, etc., to the United States Post Office at Hoboken, N. J., in accordance with drawings and specifications, copies of which may be obtained from the custodian at Hoboken, N. J., or at the Supervising Architect's office.

POST OFFICE, MANITOWOC, WIS.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until October 20 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at Manitowoc, Wis., in accordance with drawings and specifications, copies of which may be had from the custodian of site at Manitowoc, Wis., or at the Supervising Architect's office.

NEW MANUFACTURING COMPANIES.

SEATTLE, WASH.—The Pacific Battery and Electric Novelty Manufacturing Company has been incorporated, with a capital of $100,000.

LOS ANGELES, CAL.—The General Special Electric Company has been incorporated, by O. A. Glasgow and others, with a capital stock of $100,000.

JERSEY CITY, N. J.—The Tate Gas Electric Motor Vehicle Company has been incorporated to manufacture motor vehicles, motor boats and aerial machines, with a capital of $100,000. The incorporators are: J. L. Tate, C. E. Tate and J. L. Tate, Jr., Jersey City.

AUGUSTA, ME.—The American Power and Light Company has been incorporated, with a capitalization of $15,000,000. The company will manufacture machinery and electrical apparatus. The promoters are Harry M. Durning, George J. Anderson, H. B. Squiers and E. W. Hammonds, all of New York city. None of the capital stock is paid in. Stock of the company is valued at $100 par.

INDUSTRIAL ITEMS.

THE H. T. PAISTE COMPANY, PHILADELPHIA, PA., is issuing a new, conveniently arranged price list of its electric-light supplies.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., is distributing several new folders descriptive of Columbia tungsten sign lamps. These circulars contain information of an educational nature which should assist central-station managers in increasing their load.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn., has issued the October number of "Trumbull Cheer," which contains, besides the usual magazine stuff, some particulars, with illustrations, of Trumbull panel boards, Kappa switches and panel cut-outs.

EDGAR ALLEN AND COMPANY, LIMITED (Imperial Steel Works), Sheffield, Eng., announce that their arrangement with Edwin R. Kent and Company for the sole agency of their manufactures in the United States, terminated on June 30 last. The company will continue to maintain offices under its own name at 282 Pearl Street, New York city, and 23 West Randolph Street, Chicago, where full stocks of tool steels and other specialties manufactured by the company will be carried.

THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, Pittsburg, Pa., in Circular No. 1502, gives a great deal of valuable information on alternating-current distribution covering transformers, lightning arresters, insulators, cross-arms, etc. Considerable space is devoted to underground and overhead construction applicable to congested and scattered districts. There is also given information on potential regulating systems. The circular contains fifty-two pages of information of value to any central-station man or anyone connected in any way with the distribution of power by alternating-current lines.

THE KEUFFEL & ESSER COMPANY, New York, N. Y., has published an interesting eight-page pamphlet, describing the K. & E. log-log duplex slide rules, manufactured by this concern. They are especially devised for the solution of examples and formulas involving fractional powers and roots, as well as natural or hyperbolic logarithms. In addition to the log-log scale, all the ordinary logarithmic and trigonometrical scales are on the log-log duplex slide rules, and these rules are therefore capable of performing a practically unlimited range of problems. They are made in two sizes. The smaller rule does not have the D scale on both sides, but otherwise embodies all the novel features of the larger rule. The log-log scale, as its name indicates, represents the logarithms of the logarithms of a series of natural numbers, so that, while the C. D. scale gives the logarithmic loca-

tion of the natural numbers read on them, the log-log scale gives the corresponding log-log location. The value of such an arrangement is best appreciated in involution and evolution, where the root or the power is taken on the log-log scale, while the exponent or root index is taken on the C scale, proceeding as in ordinary multiplication or involution and as in division for evolution.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has recently issued bulletin No. 4675, which describes and illustrates a new single-phase induction motor of the repulsion induction type, designated as Type "RI," and developed for use in connection with installations where the starting torque of the resistance reactance type of induction motor will not meet the demand of the driven machine, or where within certain limits variable speed is required. The bulletin mentions various applications of this type of motor, illustrates and describes controllers for use in starting it and contains other data, including diagrams of connections.

THE WESTINGHOUSE MACHINE COMPANY, of Pittsburg, has supplied four thirteen-by-twelve-inch, three-cylinder Westinghouse gas engines, direct-connected to Root position blowers, for the Public Service Corporation of New Jersey, at its Hoboken and Passaic gas plants, for the purpose of boosting the gas pressure in the mains. The engines are of the vertical type, develop ninety horsepower each, and utilize illuminating gas for fuel. This application of gas engines to raising the pressure in gas lines is one that is attracting much favor among the officials of the Public Service Corporation, and it is expected that the future will see a great many similar installations for this work.

THE LIBERTY ELECTRICAL MANUFACTURING COMPANY, 543 Fourth Avenue, Pittsburgh, Pa., has ready for distribution some very interesting information concerning its noncellulose carbon filaments. These filaments are prepared by a French process from pure carbon black having only sufficient binder to make the mass of proper consistency to squirt into the filament shape before carbonizing. As a result there are no air bubbles, no uneven diameters, no chemical processing, and the life of the filament is very certain. It is stated that in flashing these filaments, ninety per cent can be relied upon for proper candlepower, watts and volts, and ten per cent vary only a few volts. Full information will be sent to those interested upon request.

THE GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., has issued a number of new publications, as follows: Bulletin No. 4665, "Electrical Operation of Pulp and Paper Mills," describing and illustrating the application of the electric motor to the paper industry. Bulletin No. 4680, "Sign Lighting with Tungsten Lamps," showing by means of curves the comparative cost of sign lighting with carbon and tungsten lamps. This bulletin also discusses at some length the points in favor of the tungsten lamp. Bulletin No. 4688, "Compound Meter Board," describing a new meter board of moulded metal material which is intended to replace the wooden board used in mounting meters. This company has also issued two attractive booklets describing its tungsten lamps and small fan motors, respectively.

THE UNION SWITCH AND SIGNAL COMPANY, Swissvale, Pa., has prepared a new catalogue of its electric crossing-bell appliances. This catalogue of sixty pages gives detailed descriptions and prices of the large number of crossing-bells made by this company. They are arranged for direct-current and alternating-current operation, and are suitable for electric or steam railroads. Layouts of single and double-track installations are given. Interlocking relays for this service are described for various classes of service. In its new bulletin No. 41 the company describes its latest form of universal relays, type 9C. This bulletin of thirty-six pages is elegantly illustrated with the details of the various forms of these universal relays, and gives the improvements that have been made in their construction.

THE ALBERT AND J. M. ANDERSON MANUFACTURING COMPANY, Boston, Mass., has issued an attractive illustrated bulletin (No. 22) on the Anderson automatic time switch. These time switches can be used to advantage in all cases where a circuit has to be opened or closed at definite times and at points where there is no reliable person stationed to do this work. Great economies may oftentimes be accomplished by the use of a time switch in place of a device requiring personal attention. The bulletin shows, with the aid of some excellent diagrams, the construction and working of the Anderson switch, and in addition gives instructions for its adaptation in connection with show-window illumination, after closing, up to a predetermined time, for turning on and off electric signs, for handling individual street lights, etc.

FRANK W. PARDEE, 48 Fifth Avenue, Chicago, manufacturer of the Paragon Ground Cone, has just returned from an extended trip through the East in the interest of his cone and other specialties. The cone particularly met with great favor among the engineers of central stations, trolley lines, power plants, and telephone and telegraph companies. Mr. Pardee also says that when he showed the cone to the various jobbers and independent engineers, they were as enthusiastic about it as he himself. He was greatly gratified to find that the central-station engineers, particularly, believe that the cone is going to solve one of their greatest difficulties and fill a long-felt want. It is used by them largely for grounding transformer secondaries and for grounding neutrals of three-wire systems. It is also being used with a great deal of satisfaction for grounding lightning arresters of every type.

THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, Pittsburg, Pa., in circular No. 1132 describes the Westinghouse lightning protective apparatus. This takes up in detail the theory of lightning discharges, an analysis of the lightning arrester problem, and describes Type MP lightning arresters for alternating and direct-current circuits up to 1,000 volts, Type C for alternating-current circuits from 500 to 2,500 volts, Type S for 2,200 to 6,600 volts alternating current, Types E and A electrolytic arresters 4,000 to 110,000 volts alternating current, low equivalent arresters 3,600 to 50,000 volts alternating current, Types I and J up to 4,000 volts, fuse-type lightning arresters, choke coils, spark gaps, safety gaps, selection and location of protective apparatus, location of choke coils, insulation and ground connections. This circular forms one of the most interesting and valuable pieces added to the literature of lightning protection.

J. B. TAYLOR & COMPANY, INCORPORATED, have been chartered under the incorporation laws of Delaware to do a general engineering and contracting business. The capital stock is $500,000. The company's offices are at 305-322 Hudson Terminal Building, New York city. W. E. McClintock is chief engineer. Four departments have been organized: The engineering department will design the complete plants for public utility corporations and make reports on electric railway, light, power and similar projects for trust companies, bankers and investors. The operating department will undertake the operation of such systems. The construction department will build the plants completely and install all the apparatus needed for their equipment. The finance department will assist the financing of meritorious public utility projects. Among the important work of this company upon which it is at present engaged is 300 miles of construction work on the American Central Railway between Vernon and Miami, Tex.

THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY has issued, through Thomas A. Biddle and Company, of Philadelphia, a handsome twenty-four-page pamphlet, reviewing the property and interests of the company. The American Telephone and Telegraph Company began operating in 1885, when it established the long-distance lines. In 1900 it acquired control of all the Bell Telephone systems. The history of the telephone company and its earnings are carefully reviewed, and the steps in the rise of the company to its present growth are pointed out. Attention is directed to the fact that under patent protection all the Bell Telephone companies in the country had only 250,000 stations. This number has been increased in the past fifteen years, without patent protection and with competition, to 4,364,629 stations. Of this total, 525,629 were gained during 1908, a year of general business depression. This gain of 14 per cent was accomplished by a gain in net earnings of 10 per cent. It is now, therefore, an operating company, operating all long-distance lines; is a holding company, owning a majority of stock of all the Bell Telephone systems; and it also owns all of the Bell telephone instruments and electrical appliances. There was a daily average of 19,000,000 calls a day over this system last year, or, reckoning on a business day of ten hours, considerably more than 31,000 calls a minute.

THE AMERICAN DISTRICT STEAM COMPANY, Lockport, N. Y., in its bulletin service, has contributed some of the most complete and interesting data on the subject of district steam heating which is available for study of engineering of this nature. Not only has the subject been taken up from a general standpoint, but there are a number of treatises which describe specific installations where both live and exhaust steam heating plants are operated from central stations. To anyone interested in this matter the company's literature should prove very valuable. Specific information on any subject coming under this category may be secured upon request. Among the bulletins which have already been published may be mentioned the following: Catalogue 8, "Price List of General Supplies for Heating Trade;" Bulletin 101, "Steam Traps, Meters, Separators, Cooling Coils;" Bulletin 102, "Valves, Pressure Regulating and Reducing Valves and Thermostats;" Bulletin 103, "Steam Pipe Casing, Wooden Water Pipe;" Bulletin 104, "Anchorage Fittings, Expansion Joints and Special Fittings;" Bulletin 105, "Underground Pipe for Steam Distribution;" Bulletin 106, "Atmospheric System of Heating;" Bulletin 108, "Atmospheric System of Steam Heating;" Bulletin 109, "Suggestions for Consumers and Prospective Customers of District Steam Heating Plants;" Bulletin 110, "Some Results of Steam Heating from a Central Station;" Bulletin 111, "A Live Steam Heating Plant at Wilkes-Barre, Pa.;" Bulletin 112, "An Exhaust Steam Heating Plant from a Central Station at West Chester, Pa.;" Bulletin 113, "Standard Steam Pipe Casing and Wooden Water Pipe."

DATES AHEAD.

New York Electrical Show. Madison Square Garden, New York, October 11-21.

Railway Signal Association. Annual meeting, Louisville, Ky., October 12-14.

The Order of Rejuvenated Sons of Jove. Seventh annual meeting, Cleveland, Ohio, October 14 and 15.

Western Association of Electrical Inspectors. Annual meeting, Detroit, Mich., October 26, 27 and 28.

Illinois State Electric Association. Annual meeting at Alton, Ill., October 26, 27 and 28.

Alabama Light and Traction Association. Annual convention, Birmingham, Ala., November 15 and 16.

American Association of Electric Motor Manufacturers. Next meeting, St. Louis, Mo., November 15 and 16.

Boston Electrical Show. Mechanics' Building, Boston, November 15-25.

Empire State Gas and Electric Association. Annual convention, New York city, November 17 and 18.

Directory of Electrical and Allied Engineering and Scientific Societies.

(Published in the second issue of each month.)

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NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

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WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 207 East Ohio Street, Chicago, Ill. Annual convention, Detroit, Mich., October 26-28, 1909.

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WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. C. Crowley, Jr., Superior, Wis.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) September 21, 1909.

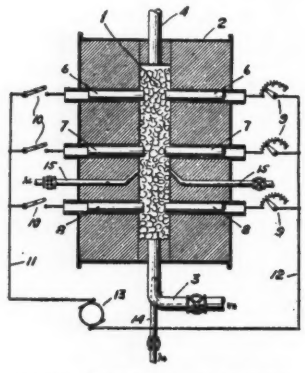
934,988. PROCESS OF MAKING DURABLE CARBON ELECTRODES FOR ELECTROLYTICAL PURPOSES. Gustav Adolph, Ammendorf, and Albert Pietzsch, Madgeburg, Germany, assignors to Chemische Fabrik Buckau, Magdeburg, Germany. Filed April 27, 1907. The process of making electrolytic electrodes resistant to chemical attack, comprises impregnating the carbon throughout the entire body of the electrode with an electrical conductor of the first order, forming conducting bridges between the particles of carbon, whereby local electrolytic actions between the particles of the electrode are prevented.

934,992. ADJUSTABLE ELECTRIC-LIGHT HANGER. Louis Buendert, Chicago, Ill. Filed August 12, 1907. Push buttons are fastened to a spring clamp secured within the lower (detachable) portion of a globular casing, and a spring-operated pulley is adapted to take up and pay off surplus lengths of a cable containing electrical conductors feeding a lamp or lamps.

934,995. OUTLET-BOX. Lewis H. Church, Stamford, Conn. Filed March 31, 1906. Renewed March 15, 1909. A bushing for outlet boxes comprises a tapered, split body-portion having an oppositely tapered bore, and means for the retention of the body-portion in the cable-receiving opening of the box.

934,996. RAILWAY-SIGNAL. Clarence W. Coleman, Westfield, N. J., assignor to the Hall Signal Company. Filed February 12, 1908. Signal-controlling circuits comprise the track, sources of supply are provided at intervals in operative relation therewith, and bonds diagonally connecting the rails of the track and each completing signal-controlling circuits from a source at each side of the bond.

934,997. ELECTRIC DISTRIBUTION. John L. Creveling, New York, N. Y., assignor to Safety Car Heating and Lighting Company. Filed April 16, 1909. In combination with a source of current supply are translation circuits and means for regulating the voltage upon these circuits, and a variable shunt (around this means) the resistance of which depends upon the number of translation circuits in operation.



934,344.—PROCESS OF MAKING WATER-GAS.

935,012. ELECTRIC SHADE HOLDER. Emil F. Gennert, New York, N. Y., assignor to the Manhattan Brass Company. Filed April 29, 1909. The holder has a beaded neck provided with notches, slits connecting the notches with perforations in the holder, and means for supporting a shade, in combination with an annular beaded collar provided with depressions adapted to engage the beaded neck.

935,023. SELECTIVE A.C.-D.C. SYSTEM. George H. Hill, Schenectady, N. Y., assignor to General Electric Company. Filed January 18, 1908. Describes such a system for electric cars.

935,024. LOCK-OUT TELEPHONE SYSTEM. William W. Hill, Sumter, Minn. Filed May 16, 1908. Differentially acting devices are provided at the several stations for closing the transmission line.

935,040. TROLLEY-BASE. Leslie F. Mansfield and Paul D. Smith, Minneapolis, Minn. Filed June 15, 1908. The springs are put under tension by means of a toggle device.

935,049. CALLING DEVICE FOR TELEPHONE EXCHANGES. Nils E. Norstrom, Chicago, Ill., assignor to the Anderson Electric and Manufacturing Company. Filed November 16, 1904. Renewed February 10, 1909. Comprises a spring by which the device is actuated, a series of numbered levers or keys by the movement of any one of which the spring is wound, and means by which upon moving any one of the levers the calling device will be automatically set for the selection of a station corresponding to the particular lever moved.

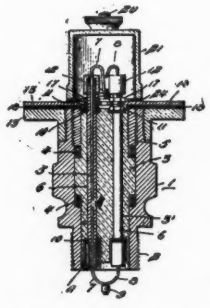
935,051. DEVICE FOR REGULATING THE SPEED OF GENERATORS TO SECURE CONSTANT POTENTIAL. Arthur L. Parker, Cleveland, Ohio. Filed November 9, 1908. In combination with a generator, are a prime mover, a differential mechanism operatively connecting the prime mover and generator, means for holding the differential mechanism normally from compensating, and means for causing the differential to compensate to reduce the speed of the generator when the voltage across the generator brushes exceeds a predetermined voltage.

935,069 and 935,070. SELECTIVE A.C.-D.C. SYSTEM. John F. Tritle, Schenectady, N. Y., assignor to General Electric Company. Filed January 18, 1908. Similar to No. 935,023.

935,092. CIRCUIT-CONTROLLING MECHANISM. Maxwell W. Day, Schenectady, N. Y., assignor to General Electric Company. Filed October 17, 1906. Circuit-breakers are automatically opened by abnormal current-variations.

935,097. OUTLET BOX FOR ELECTRIC FIXTURES. Oscar F. Erickson, Berkeley, and Richard H. Bradshaw, Oakland, Cal. Filed June 11, 1908. Describes an outlet box having a base and cylindrical wall formed integral with a lath-and-plaster backing for securing to a wall.

935,105. TELEPHONE SYSTEM AND THE LIKE. Robert Hamilton, Boston, Mass. Filed June 1, 1908. Means are provided at each station for closing the main-line controlling switch and maintaining the latter continuously closed while the system is in use, and means at each station for selectively controlling communication between each station and the other stations of the system through the main-line circuit.



935,154.—DYNAMOMETER THERMO-COUPLE FOR EXPLOSION ENGINES.

935,109. APPARATUS FOR THE ELECTROLYSIS OF AQUEOUS SOLUTIONS. Max Huth, Charlottenburg, near Berlin, Germany, assignor to Siemens & Halske A. G., Berlin, Germany. Filed January 5, 1909. The process of producing massive peroxide of manganese anodes for electrolyzing aqueous solutions, consists in heating pure nitrate of manganese in molds.

935,136. SUSPENSION DEVICE FOR ELECTRIC ARC LAMPS. Adolph Wunderlich, Croydon, England, assignor to the London Electric Firm, Croydon, England. Filed May 10, 1906. The lamp carried is guided by an arrangement of cams, etc.

935,150. AUTOMATIC PAY-STATION. Harry W. Hamlin, Milo, Me. Filed September 17, 1908. Describes a form of coin-actuated mechanism with electrical contacts.

935,154. DYNAMOMETER THERMO-COUPLE FOR EXPLOSION ENGINES. Nevil M. Hopkins, Washington, D. C. Filed July 28, 1908. Comprises a metal body, insulated

thermo-couple wires having their ends united to provide a heat-receptive junction (the wires being longitudinally adjustable in the body and exposing a variable length to the source of heat), and stuffing boxes receiving the outer ends of the wires.

935,164. TELEGRAPH-KEY. George S. Perry, Branford, Fla. Filed January 28, 1909. Includes an energizing circuit, a key lever, a vibrator actuated by the lever, and an oscillating member disposed in the path of movement of the vibrator and arranged to intermittently close the circuit.

935,178. WORD-METER. Herbert I. Watts, Winchester, Ind., assignor of one-third to Edward S. Goodrich and one-third to George H. Ward, Winchester, Ind. Filed March 27, 1909. A typewriter electromagnetically operates a cyclometer step by step with the space key.

935,180. GRAPHITE ARTICLE AND PROCESS OF MAKING THE SAME. Arthur M. Williamson, Niagara Falls, N. Y., assignor to International Acheson Graphite Company, Niagara Falls, N. Y. Filed July 19, 1909. Carbon articles impregnated with materials yielding a carbonaceous residue are subjected to a graphitizing process, thereby producing graphite having small porosity.

935,207. AUTOMATIC FLASHER FOR ELECTRIC LIGHTS. John O. Houser, Cincinnati, Ohio. Filed May 22, 1908. Has a bar carrying a contact piece, another bar carrying another contact piece and having a slot therein, a cam adapted to rotate through the slot in the bar, means for engagement between the cam and the bar, and means for electrically connecting the bars with the electric lights and to the source of an electric current.

935,215. RAILWAY-SIGNAL. Alonzo C. Mather, Chicago, Ill. Filed July 3, 1907. A lever is electromagnetically operated.

935,226. ELECTRIC SWITCH. Johann G. Peterson, Hartford, Conn., assignor to the Arrow Electric Company, Hartford, Conn. Filed December 28, 1908. Describes a form of push-button switch.

935,250. ELECTROLYTIC WINNING OF ZINC FROM SOLUTIONS OF ZINC SULPHATE. Victor Engelhardt and Max Huth, Charlottenburg, Germany, assignors to Siemens & Halske Aktiengesellschaft, Berlin, Germany. Filed May 25, 1907. The process consists in employing an anode of lead peroxide in compact form and free from constituents or parts attackable by the electrolyte.

935,252. STORAGE-BATTERY ELECTRODE. Louis H. Flanders, Wilkinsburg, Pa., assignor to the Westinghouse Machine Company. Filed December 15, 1905. Comprises a number of panels and flexible means connecting adjacent ends of the panels.

935,285. APPARATUS FOR FACILITATING COMMUNICATION BETWEEN TELEPHONE EXCHANGES. Arthur T. M. Thomson, London, England. Filed August 28, 1906. A rotary visiting organ is provided with the contact springs electrically connected to a concentrically-mounted ring on the organ.

935,291. ELECTROMAGNETIC DRILL-SUPPORT. George Boenig, Trenton, N. J. Filed July 14, 1908. A support for portable drills has a base comprising two sections hinged together, an electromagnet in each section, and electric circuit wires connected to one end of one section.

935,299. FORMER FOR ARMATURE COILS. Edwin Denham, Swissvale, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed January 5, 1907. Describes a coil-bending machine.

935,300. COMMUTATOR. William A. Dick, Pittsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed November 8, 1907. In combination with a commutator bar, is a two-part neck or connecting strip the parts of which are connected together by a hinge joint.

935,304. TROLLEY SWITCH-PLATE. Edward Heydon, Indianapolis, Ind. Filed February 13, 1909. A wire-receiving finger is provided with a pair of flanges decreasing in depth so that a gradual approach from trolley wire to plate may be produced.

935,316. PROCESS OF PREPARING STORAGE-BATTERY PLATES. William Morrison, Chicago, Ill., assignor to David P. Perry, Chicago, Ill. Filed December 26, 1903. The process of preparing a storage-battery plate, which includes as steps the repeated immersion of the plate in different solutions formed by combining ingredients including glycerin, sulphuric acid, formaldehyde and formic acid.

935,319. HANGER FOR ELECTRIC OUTLET-BOXES. Adnah McMurtrie, New York, N. Y., assignor to Thomas & Betts Company, New York, N. Y. Filed January 15, 1906. An interiorly threaded annular member is arranged to pass and be seated upon the threaded periphery of the article to be secured, such as a pipe, and an integral loop portion extends at an angle to the annular member in position to pass the article to which attachment is to be effected, the loop being of sufficient size to permit free traversal by said articles into binding contact with each other, and open to permit inspection.

935,320. ANNUNCIATOR. Elmer E. Nye, Los Angeles, Cal. Filed February 11, 1908. Comprises a service drop, a plurality of location drops, a latch for each drop and a bail connection to the latch for the service drop and operated by lifting of the latch of any of the location drops.

935,327. CONTROLLING ELECTRIC MOTORS. Joseph L. Routin, Lyon, France. Filed February 10, 1908. Describes a form of electric servo-motor.

935,344. PROCESS OF MAKING WATER-GAS. Charles E. White, Philadelphia, Pa. Filed January 26, 1909. The process consists in confining a mass of refractory material, heating portions of the mass to different temperatures by the application of different current densities thereto, and at the same time passing steam or water vapor through the heated mass of refractory material.

935,346. ELECTRICAL WELDING-MACHINE. William C. Winfield, Warren, Ohio. Filed August 17, 1908. Comprises a movable power member and a current-conveying contact member having a ball connection therewith, and a second current-conveying member having a number of contact pins opposite the first contact member.

935,347. REFLECTOR. Lawrence Zamboni, New York, N. Y., assignor to Charles A. Sterling, Orange, N. J. Filed November 16, 1907. A reflector of disk form is provided with yielding holding arms normally located in the plane of the disk, and an opening at the inner ends of the arms.

935,348. MEANS FOR USE IN CONNECTION WITH COMBINED REFLECTORS OR SHADES AND ELECTRIC LAMPS. Lawrence Zamboni, New York, N. Y., assignor to Charles A. Sterling, Orange, N. J. Filed November 23, 1908. Describes a means for insulating a conducting or metallic reflector or shade from both of the conducting terminals of an electric lamp.

935,352. ALTERNATING-CURRENT MOTOR. Alonzo C. Bell and Thaddeus R. Bell, Westfield, N. J. Filed November 23, 1908. Describes the details of a commutator for a self-starting single-phase motor.

935,363. ELECTRIC HOIST. Alfred A. C. Gese, Bremen, Germany. Filed April 29, 1908. A portable electric hoist comprises a motor, a controller, a hoisting drum mounted between the motor and controller and having its axis perpendicular to the axis of the motor shaft, and gearing connecting the latter and hoisting drum.

935,381. TRANSMITTING APPARATUS FOR WIRELESS TELEGRAPHY. Guglielmo Marconi, Adelphi, London, England, assignor to Marconi Wireless Telegraph Company of America, New York, N. Y. Filed October 1, 1907. In combination with a sending circuit, are mechanically operated means for positively completing and interrupting the circuit synchronously with the time period of Hertzian oscillations of definite frequency.

935,382 and 935,383. APPARATUS FOR WIRELESS TELEGRAPHY. Guglielmo Marconi, Adelphi, London, England, assignor to Marconi Wireless Telegraph Company of America, New York, N. Y. Filed April 10, 1908. Describes transmitting apparatus.

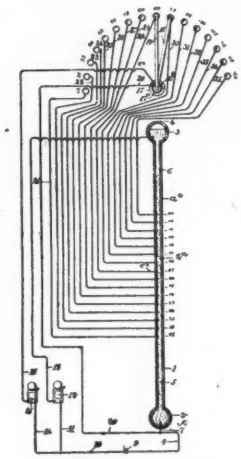
935,386. WIRELESS TELEGRAPHY. Walter W. Massie, Providence, R. I., assignor to Massie Wireless Telegraph Company, Providence, R. I. Filed February 27, 1907. A magnetic detector having a coil and magnets has means for simultaneously moving the magnets toward and simultaneously from each other in a direction substantially axially of the coil.

935,397. ARMATURE. John P. Nikonow, Evansville, Ind., assignor to Schroeder Headlight Company, Evansville, Ind. Filed November 10, 1908. Comprises a core, windings for exciting the same, a cap engaging the windings, leads connected with the windings and extending outwardly over the cap, a commutator connected with the leads, and an endless metallic member encircling the leads and disposed adjacent to the cap.

935,457. APPARATUS FOR ELECTRICALLY TREATING AIR AND OTHER GASES. James H. Bridge, Philadelphia, Pa. Filed April 30, 1907. An ozonizer contains a perforated electrode adapted to allow air or other gas to pass into a number of discharges originating thereon, and then to be led through the perforations in fine streams to the other side of the electrode out of the influence of the discharges.

935,460. ELECTRIC THERMOSTAT. James R. Carpenter, Hancock, Mich., assignor of one-half to Theodore A. Steller, Houghton, Mich. Filed August 31, 1908. Comprises a maximum and minimum thermometer, alarms (controllable of maximum and minimum temperatures), including electric circuits, a number of contact members connected with the maximum and minimum thermometer, etc.

935,503. CAPPING-MACHINE FOR INCANDESCENT BULBS. Thomas J. Hetherington, Youngstown, Ohio. Filed February 27, 1909. Describes such a machine in detail.

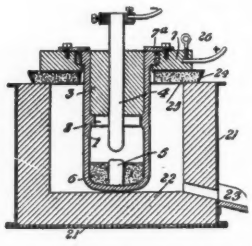


935,460.—ELECTRIC THERMOSTAT.

935,515. COIN-FREED LOCKING DEVICE FOR TELEPHONE APPARATUS. Hermann Janke, Halberstadt, Germany. Filed January 28, 1909. The insertion of a coin releases the hearer hook of the telephone apparatus.

935,518. ELECTRIC ARC LAMP. Adrian D. Jones, Holloway, London, England. Filed September 16, 1907. Has an arc-enclosing chamber, unobstructed draft chambers, communicating with its upper and lower ends, and unobstructed draft tubes connecting the upper and lower draft chambers, and forming therewith a substantially airtight receptacle.

935,523. ATTACHMENT-PLUG. Charles J. Klein, New York, N. Y., assignor to Ida S. Rosenheim, New York, N. Y. Filed February 25, 1907. Comprises two separably operatively connected body members jointly provided with means for maintaining electrical circuit conditions, and connection



935,548.—ELECTRIC FURNACE.

means detachably uniting the body members and enabling the same to be angularly separated.

935,542. METHOD OF TREATING SODIUM PEROXIDE. David E. Parker, Niagara Falls, N. Y. Original application filed May 18, 1906. Divided and this application filed August 27, 1906. The process consists in subjecting the peroxide to an electric current for melting the same, maintaining the temperature of the melted peroxide by the electric current at such a point as to liberate any carbonic acid gas contained therein without freeing the oxygen from the molten material, and finally solidifying the electrically-treated material.

935,548. ELECTRIC FURNACE. Alleyne Reynolds, London England. Filed February 10, 1908. An electric-heating element comprises a tube of carbonaceous material immersed in the furnace charge, means are provided for closing the ends of the tube, also means for conducting an electric current to the interior of the tube, and means for converting electric energy into heat within the tube.

935,558 and 935,559. CARPET SWEEPER AND CLEANER. James M. Spangler, Canton, Ohio, assignor to the Electric Suction Sweeper Company, New Berlin, Ohio. Filed November 16, 1908, and February 3, 1909. Is driven by an electric motor.

935,605. SAFETY APPLIANCE. Quincy T. Howard and William M. Stark, Muscatine, Iowa. Filed December 31, 1906. Describes an electric system for operating the brakes of a vehicle through conductors arranged along the track and engaging with contact devices on the vehicle.

935,614. BLOCK-SIGNAL SYSTEM. Herbert H. Sims, James M. Hatch, and James M. Turrentine, Raleigh, N. C., assignors of one-fifth to Albert L. Cox and one-fifth to William H. Pace, Raleigh, N. C. Filed March 16, 1909. Comprises stations at opposite ends of each block, a telephonic transmitter and receiver at each station, wires connecting the same, and sound-receiving funnels connected with each transmitter and arranged over the track at an elevation above the moving train.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired October 4, 1909:

483,545. ELECTRIC FAN. Elisha B. Cutten, New York, N. Y.

483,556. ADJUSTABLE ELECTRIC-LIGHT HANGER. Herbert L. Holt, Ellsworth, Me.

483,562 and 483,563. STORAGE BATTERY. Edward R. Knowles, Brooklyn, N. Y.

483,564. ELECTROMAGNETIC MECHANISM FOR OPERATING PRINTING PRESSES. Ernst H. Korsmeyer, Kansas City, Mo.

483,582. MOTOR-MOUNTING FOR ELECTRICALLY-DRIVEN FANS. Andrew L. Riker, New York, N. Y.

483,625. ELECTRIC BURGLAR-ALARM. Homer T. Wilson, Louisville, Ky.

483,646. PROCESS OF MAKING ARTIFICIAL MICA SHEETS FOR ELECTRICAL INSULATION. Arthur H. S. Dyer, Schenectady, N. Y.

483,653. MOLDING MICA FORMS FOR ELECTRICAL INSULATORS. Chas. W. Jefferson, Schenectady, N. Y.

483,654. GALVANIC BATTERY. Harry T. Johnson, New York, N. Y.

483,692. ELECTROLYTIC DIAPHRAGM. Anton J. Lehman, New York, N. Y.

483,700. ARMATURE FOR DYNAMOS AND MOTORS. Elihu Thomson, Swampscott, Mass.

483,704. ELECTRIC SWITCH. David H. Armstrong, Long Island City, N. Y.

483,712. ELECTRIC SWITCH. Axel Eckstrom, Lynn, Mass.

483,713. ELECTRIC SNAP SWITCH. Axel Ekstrom, Lynn, Mass.

483,728. ELECTRIC BURGLAR-ALARM. Alfred Stromberg, Chicago, Ill.

483,729. ARMATURE-WINDING FOR DYNAMO-ELECTRIC MACHINES. Ernest P. Warner, Chicago, Ill.

483,732. COMMUTATOR FOR ELECTRIC MACHINES. Norman C. Bassett, Lynn, Mass.

483,739. DOOR-LOCK SWITCH FOR ELECTRIC LIGHTS. Chas. Green, Toronto, Canada.

483,745. ELECTRO-THERAPEUTICAL INSTRUMENT. Jas. W. Moliere, San Francisco, Cal.

483,758 and 483,759. ELECTRICAL HEATER. Arthur E. Appleyard, Boston, Mass.

483,761. CLOSED CONDUIT FOR ELECTRIC RAILWAYS. Wm. G. Creighton, Norwood Park, Ill.

483,768. POLICE-TELEGRAPH SYSTEM. Chas. A. Rolfe, Chicago, Ill.

483,782. THERMO-ELECTRIC BATTERY. Paul Giraud, Chantilly, France.

483,822. ELECTRIC LOCOMOTIVE. Thomas L. Willson, Brooklyn, N. Y.

483,844. BURGLAR-ALARM CONTACT. Nevil M. Hopkins, Washington, D. C.

483,856. ELECTRIC RAILWAY. Wm. G. Murphy, Jr., Marysville, Cal.

483,862. ELECTRIC SWITCH. Harry T. Paiste, West Chester, Pa.

483,940. ELECTRIC HEATER. Fred B. Perkins and Chas. S. Jones, Toledo, Ohio.